DECEMBER 5, 1936

# ELECTRICAL WORLD

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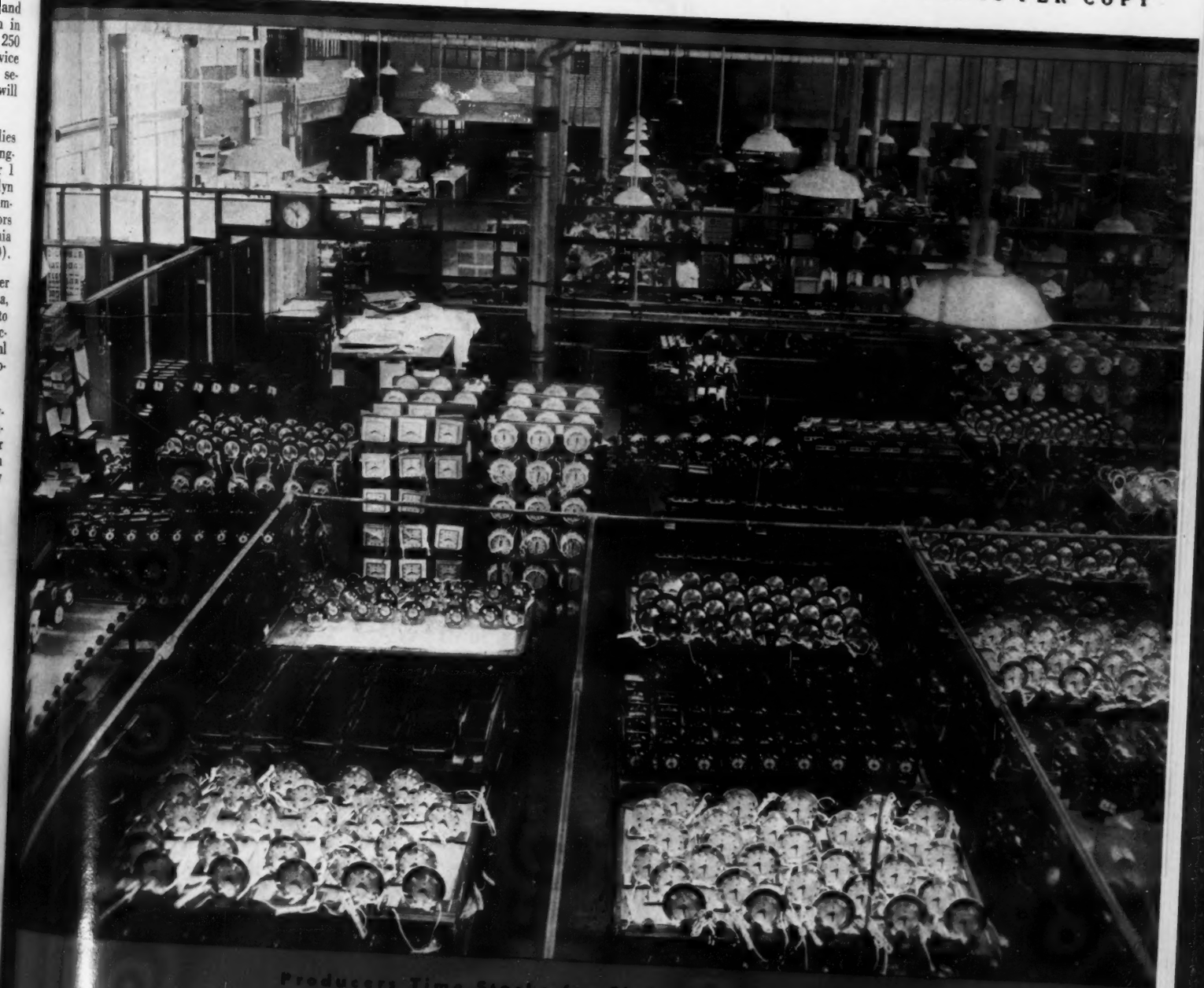

Producers Time Stocks for Christmas Demand

FEATURES IN THIS ISSUE

Voltage Step-Boosted by Current Control

Cleaning Raw Wool at 35 Deg. Below Zero

Appliance Sales Keyed to Market Analysis

# . . . A SENTRY ON THE JOB

## —SAFEGUARDING THE INTERESTS OF THE ELECTRICAL INDUSTRY

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Below: Monogrammed wire makes substitution difficult.

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# ELECTRICAL WORLD

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## Coming Features

### Less Operating Difficulties Bettered Power Factor

Here is a case where the pure power economics of power-factor correction justified only a small part of what was spent for modern equipment to obtain operating smoothness, eliminate overheating of equipment, operating interruptions and other costly nuisances.

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### The Problem of the Unprofitable Customer

Philadelphia Electric Company's Austin Monty presents a factual analysis that pictures conditions in the low income groups and points the way to effective selling to the unprofitable customer.

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### Appraisal Record by Candid Camera

Edward E. Sheldon finds one of the new cameras a valuable tool in appraisal work. Reduced expense and other advantages over the conventional tally methods are reported.

•

### Proving Tests for High-Voltage Breakers

H. M. Wilcox describes maker's technique in applying available facilities to insure conformity of multiple-break, high-voltage, oil circuit breakers with capacity rating.

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### On the Cover

Typical of manufacturers' preparations for a boom Christmas is this picture of the shipping department at the Warren Telechron plant, Ashland, Mass.

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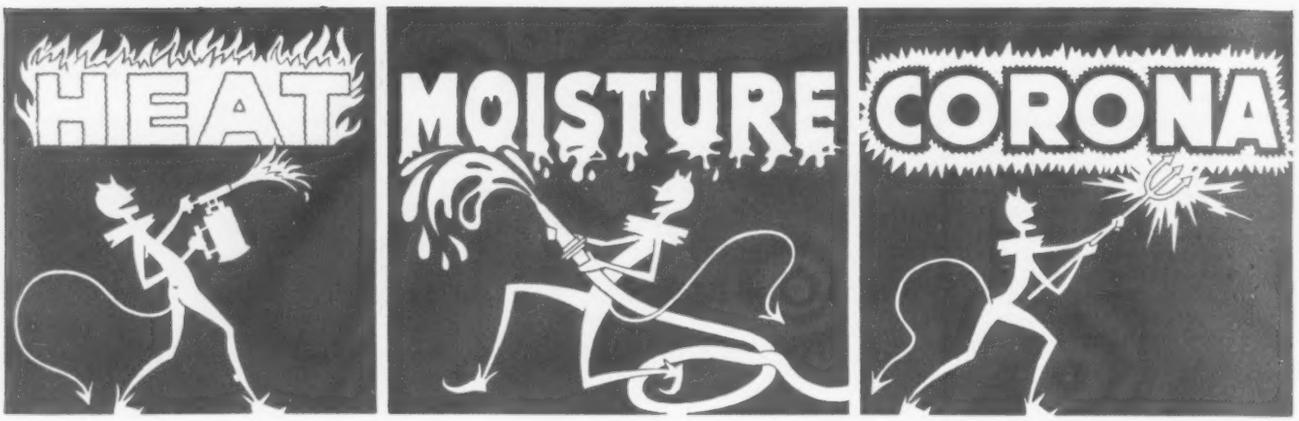


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ELECTRICAL WORLD

DECEMBER 5, 1936

# *Rural Electrification Needs Study*

Is there not enough community of interest in rural electrification within the electrical industry to bring about, first, a mutual understanding and appreciation of each other's problems and, second, a common study of the several problems involved, to the end not only that the market be a profitable one for the entire industry, but that the farmer be served properly in the beginning? Unless some such joint action is taken the headaches of rural electrification of today are as nothing compared with the trouble we are likely to have, in the not far off future, of rectifying mistakes that could have been obviated.

It is not enough to build a line and bring service into a farmstead. There must be wiring of ample capacity to make it possible for the farmer to use electric service in increasing amounts, both in the house and in the farm buildings. Wiring averaging $69 per farm, as reported in a recent E.E.I. investigation on 152,520 farms, can hardly be considered as sufficient.

There is evidence on every hand that much of the farmstead wiring is being installed by irresponsible and untrained people. This situation, which is unfortunate, both from the standpoint of the farmers and of the utilities serving those customers, can be improved by requiring competent inspection of all installations. Here there is one opportunity for contractors, manufacturers and utilities to co-operate.

A prominent English electro-farming engineer who visited a great number of farms in Illinois, Michigan, New York, Pennsylvania and New Jersey, at the time of the recent World Power Conference, points out to us two great handicaps to the development of rural electrification in this country: One, the lack of a wide range of agricultural machines designed for electric power drive, and the other, the use of single-phase current.

And there are other problems. The rise of farm co-operatives which buy appliances direct from the manufacturers are placing a serious strain upon distribution. Is it worth while for manufacturers, then, to jeopardize the well being of distributors which they have taken years to build up and in whom they have a considerable investment? It is a problem which cannot be passed over casually.

Are these co-operatives, so hastily formed, in a position to service the appliances of their members, or must the power company serving that line, or perhaps some dealer, do the servicing, and if so, will the farmer be willing to pay a price commensurate with the cost? Or will the servicing, that is so indispensable to sustained use, be forgotten altogether?

So far the greater emphasis in rural electrification promotion has been placed upon electric service in the farm home. The larger use of energy will come when the farm operations are electrified. This involves the problem of financing the purchase of such equipment.

So far the average energy consumption of rural customers, outside of a few sections of the country, is woefully small. To bring farm usage up to a point where it will prove fully advantageous to the farmer, as well as profitable to the electrical industry, will require study of the uses to which electricity can profitably be employed on the farm and then the design of appropriate and reasonably priced equipment.

Therefore, it would appear as though the speed with which rural electrification is going forward might well be matched by a greater amount of co-operative study and planning. It should give better and larger results to all concerned in the long run.

*Westinghouse*

## GAS - TIGHT WELDED GENERATOR FRAME

**Welded joints of this 20-ton frame section for a 58,000-kva. hydrogen-cooled generator must stand test for tightness at 80 lb. pressure per square inch when these welders finish their job. The section shown is one-half of the generator frame and it measures 138 in. in diameter and 104 in. in length.**

# Voltage Step-Boosted by Current Control

## Express Feeders or Reinforcement Found More Costly Than Step Boosters for Typical Situations

By A. B. HENDERSON

Assistant Engineer New York & Queens Electric Light & Power Company, Flushing

PRACTICE in the past has been to regulate the voltage on distribution feeders solely by means of induction regulators at the substation. As the system grows and the load increases, very often a condition arises such as that shown in Fig. 1. This diagram shows a typical radial distribution feeder with loads taken off at intervals along its length. Below is shown the voltage along the feeder in relation to the allowable upper and lower limits. It will be noted that even though the voltage is maintained at the allowable upper limit at the first consumer it falls below the lower limit near the end of the feeder.

When this situation arises there are several alternatives which may be pursued. Express feeders may be run to the outlying loads, thus relieving the feeders in question, or the original feeders may be reinforced to permit the heavy loading without excessive voltage drop. Both these procedures are costly—especially since long feeders will often be limited in load by voltage drop rather than by current-carrying capacity. Installation of additional copper to take care of voltage conditions while the original copper is not yet up to load is an inefficient procedure.

### *Peak boost is the criterion*

A third alternative is the installation of some sort of voltage-boosting device on the feeder which will maintain the voltage at the end of the feeder at a higher level. If the load on the feeder is fairly constant or has no pronounced peak-load period, this device could be an auto-transformer of suitable rating. On a feeder, however, which serves a residential area, the load during the day will be comparatively light and the voltage satisfactory, but during the evening peak-load period the voltage drop may become excessive. Consequently, any voltage-boosting device installed must boost only during the peak load and not during the early morning or daytime as it might cause high voltage. For this reason it would be necessary to use a booster which would automatically close in to raise the voltage only during the peak-load period.

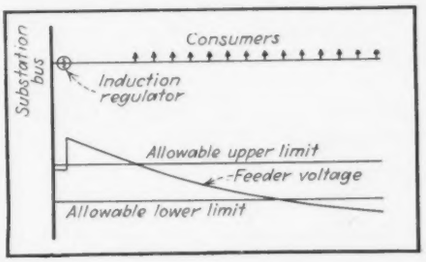


**Fig. 1—Voltage sags on typical heavily loaded distribution feeder regulated at substation**

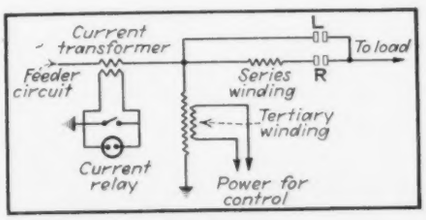


**Fig. 2—Schematic diagram of main booster circuit**

The current relay has two sets of contacts, one of which closes when the current reaches the magnitude of the pick-up setting. The contacts *R* and *L* are operated by the same solenoid and are mechanically interlocked so that one is closed when the other is open. When the current reaches the pick-up value as set on the current relay, the upper contacts close to energize the contactor coil which closes *R* and opens *L*, thus connecting the booster series winding into the feeder circuit. When the current drops to the lower setting on the current relay, the other set of contacts closes and de-energizes the contactor coil, thus causing the *L* contact to close and the *R* contact to open, disconnecting the series winding of the booster from the feeder circuit. In addition to the fundamental parts as shown in the diagram, a means must be provided for carrying the feeder load during the transfer period while both sets of contacts, *R* and *L*, are open. This part of the circuit as well as the details of the control circuit will vary with the manufacturer and are not shown.

Automatic step boosters of this kind have usually been controlled by voltage relays which operate to connect the booster into the circuit when the voltage drops to some predetermined value. This method of control is satisfactory for the usual rural or suburban circuit where the amount of voltage boost is relatively large, but where the amount of boost is quite small much of the booster effectiveness may be lost due to inherent error in the voltage control relay. This relay operates on line voltage, and even though its error may be only a small percentage of that voltage it will be correspondingly larger in reference to the voltage rating of the booster. For example, if rated line voltage is assumed to be 120 volts (referred to the secondary) and the booster is designed to give a raise in voltage of 2½ per cent (three volts), it may be seen that an error of 1 per cent in the operation of the voltage relay would amount to 1.2 volts or 40 per cent of the voltage rating of the booster.

### *Flicker avoidance another factor*

For urban distribution it is desirable to keep the voltage rating of one-step boosters at a low value for several reasons. Chief among these is the fact that the change in feeder voltage produced when the booster operates causes a corresponding change in the light intensity of lamps

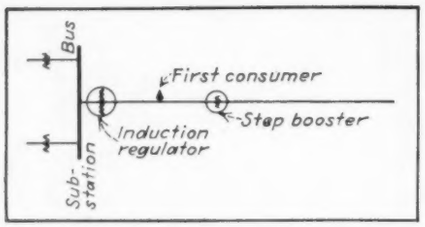


**Fig. 3—Automatic step boosters installed on radial distribution feeder**

connected to the circuit. If the booster produces too great a change in voltage, objectionable flicker may result and cause consumer complaints. Generally speaking, if a limit has been set up for allowable voltage flicker, the rating of the booster should not exceed this value. Also, two or more boosters, each providing a small boost and properly spaced on a feeder, generally will produce better over-all voltage than one booster providing a relatively high boost.

For such installations a booster has been developed which is controlled by relays that operate on magnitude of current alone. This booster can be used to compensate for voltage drop on any feeder which is fed from a regulated bus or which is equipped with induction regulators so that the voltage at the first consumer is maintained at a fairly constant value. The system of control is based on the premise that a given distribution feeder will carry a load of approximately the same power factor from day to day and that the voltage drop on the feeder will consequently be proportional to the load carried by the feeder at any given time. Similarly any percentage error in the relay will be in terms of load current or voltage drop instead of line voltage. Using the illustration cited above in the case of the voltage-controlled booster, it can be seen that a 1 per cent relay error would amount to approximately 1 per cent of the booster rating or 0.03 volt, since the voltage drop would probably be very close in value to the voltage rating of the booster. While this is an advantage of current control, it should not be concluded that voltage control for boosters is not satisfactory as there is, of course, a large number of such boosters in service performing satisfactorily.

### *One-step boosters tried out*

Several one-step current-controlled boosters have been tried out on radial distribution feeders. They were rated at 5-kva., 2½ per cent raise at 2,400 volts. The current relay can be set to pick up at values of from 15 to 100 per cent of rated load current and to drop out at values of from 0 to 85 per cent rated load current, with the two adjustments independent of each other. However, on the feeders on which the boosters were tried the relays were set to pick up at 50 per cent rated current and to drop out at 40 per cent rated current. It is probable that any feeder having the characteristics to which these boosters are most suited would require a booster setting somewhere near these values. The 10 per cent differential between pick-up and drop-out will usually be necessary to prevent pumping of the boosters due to intermittent heavy loads when the base load on the feeder is just under the drop-out setting.

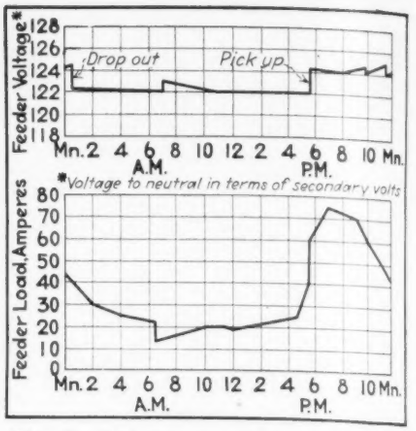


**Fig. 5—Voltage responds to load on feeders equipped with step boosters**

One set of the boosters was installed on the feeder shown in the single-line diagram of Fig. 3. Before the installation of the boosters the voltage was maintained at the allowable upper limit at the first consumer on the feeder by means of induction regulators, but the drop from that point on to the consumer at the end of the feeder was so great that the voltage was poor over the peak-load period. The boosters were installed at a point on the feeder as close to the first consumer as was permissible without causing high voltage.

The curves shown in Fig. 5 were replotted from graphic ammeter and voltmeter charts taken at the booster installation. The current curve shows the type of load to which these boosters are especially adaptable. It is light except during the evening when a heavy peak occurs and causes excessive voltage drop on the feeder. Installation of additional copper to take care of this condition on such a long radial feeder would be excessively expensive as compared to the installation of a set of boosters. The voltage curve shows that the boosters pick up

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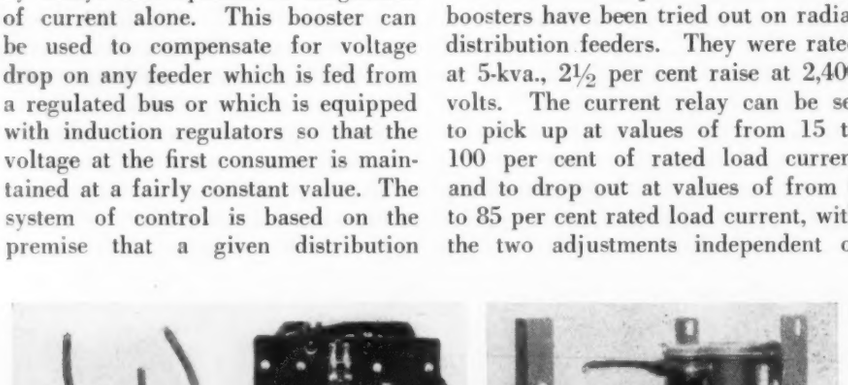



**Fig. 4—Assembled cores and accessories for branch feeder step-voltage boosters**

Each rated 5 kva., 2,400/4,160 Y volts, 60 cycles, 84/42 amp., 2.5/5 per cent raise. (A) Westinghouse (with control panel). (B) General Electric, Type MLY-1, Form N, tertiary side.

# Relay Circuits Simplified in Four Novel Ways

## Puget Sound Power & Light Company Adapts Modern Relays to Existing Protective Circuits With Maximum Economy

**By R. RADER**

Engineer Puget Sound Power & Light Company, Seattle, Wash.

IMPROVEMENTS of relays and methods of relay production have developed rapidly during the past few years. However, to take advantage of the best available protective means without excessive cost is a real problem. Often desirable improvement in relay systems means the replacement of equipment still in the prime of life. When the cost of this new equipment is computed the improvement may cost more than is economically justified. This factor was investigated in recent changes made in several places on the Puget Sound system resulting in conservation of existing equipment without sacrificing operating improvements.

### *One for three*

Following are the descriptions of four applications which are giving satisfactory service on the system at this time:

An improved relay application using a minimum of new equipment and retaining a maximum of the existing installation is shown in Fig. 1. It provides complete relay protection of a three-phase delta circuit using only one single-phase impedance relay.

Directional overcurrent protection has been replaced with directional impedance protection in rather a unique fashion, with very satisfactory results, at several locations on the 55-kv. ungrounded delta network of the Puget Sound company. In this application one single-phase impedance relay correctly measures the distance and correctly trips the circuit breaker for all classes of line-to-line faults. The construction shows that one of the two current transformers has reversed connections so that the double fault current will energize the relay when faults occur between phase wires one and three. Otherwise the current to the relay would be zero under this particular fault condition.

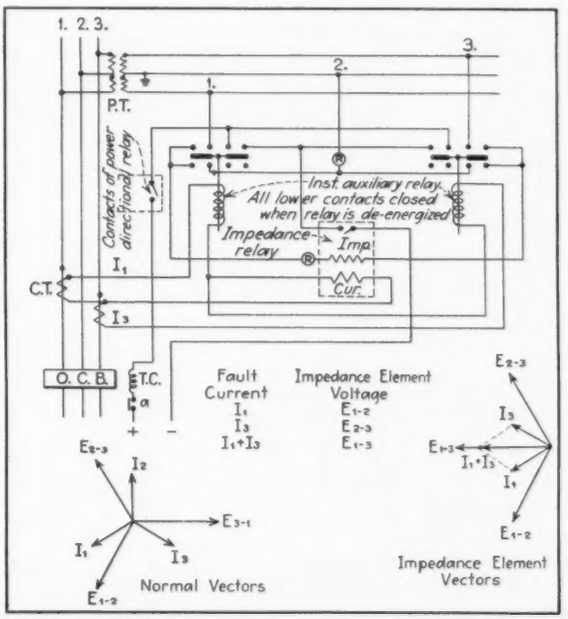



**Fig. 1—Relay application uses one single-phase impedance relay to protect a three-phase circuit**

To compensate from double current correctly, an external resistance was required which is adjusted to increase the voltage restraint, permitting proper adjustment for any desired setting. The correct voltage to impress on the impedance relay for a fault across any particular phase is obtained by means of inexpensive, instantaneous auxiliary current relays. The time delay introduced by these relays is negligible for this class of service, which is used for controlling oil switches of ordinary speeds.

This circuit can be applied easily to installations where power-direction relays are not readily installed, in which case one single-phase directional impedance relay would be required. However, the auxiliary relays would require an additional set of circuit-closing contacts in such an installation. This scheme of protection is noteworthy for its consistency of design, reliability and low cost.

The unusual relay connection shown in Fig. 2 was conceived through the need for improving service without heavy expenditure for new equipment, which would have been necessary if standard protective methods had been employed. This sectionalizing substation is located at the junction of three 110-kv. transmission lines, grounded neutral, each line being a source of power. The station is equipped with only one oil switch, which is of the high-speed type and located in the 115-mile line to White River. The Rock Island and Wenatchee lines are each 6 miles in length.

Type HZ high-speed relays were originally used to trip the switch with faults toward White River and the type ICC non-directional relay is used to trip the switch with faults toward Rock Island or Wenatchee. The ICC

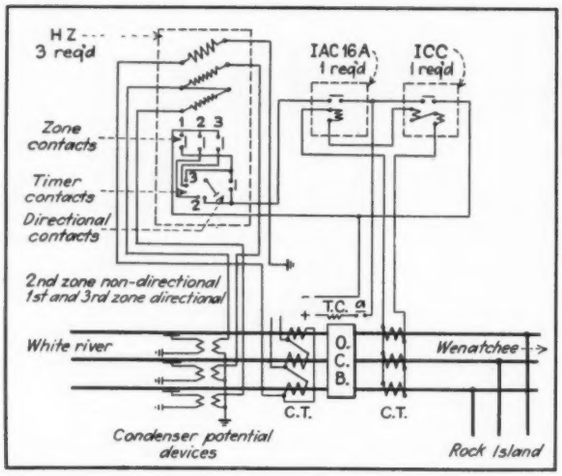



**Fig. 2—Method obtains both directional and non-directional operation from high-speed impedance relay**

The type I AC 16A high-speed current relay is connected with the circuit to prevent impedance relays from operating on surges.

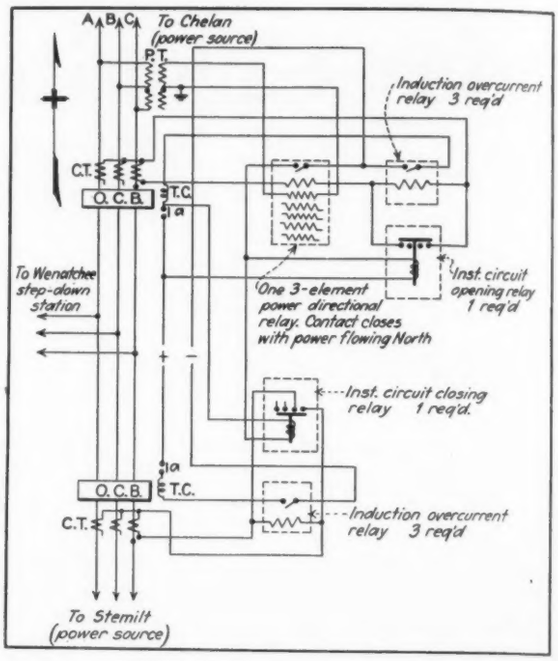



**Fig. 3—Scheme permits the directional protection of two lines with one single-throw power-directional relay**

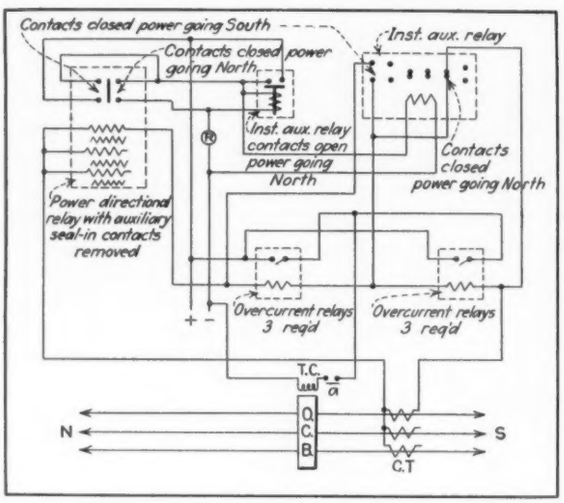



**Fig. 4—Two-way directional protection for one sectionalizing oil switch to prevent operation on surges or quick reversals of direction of power flow obtained with a minimum of equipment**

relay has considerable time delay since it operates in time sequence with relays at other stations.

The HZ relays are equipped with three zones of operation, though one instantaneous zone is all that is needed to clear faults anywhere in the 115-mile line. The other zones were used only as back-up protection. Faster clearing time was very much desired when faults occurred in the short lines to Rock Island and to Wenatchee. To accomplish this the second impedance element of the HZ relay was reconnected to operate non-directional. This required only a simple change in internal connections and no additional equipment. The slower operating ICC relay is now the second line of defense instead of the first for all wire-to-wire faults.

The same sketch shows the application of a high-speed circuit-closing I AC 16A relay with low starting current installed in the residual current circuit, which prevents the operation of the HZ relays upon the occurrence of surges or balanced three-phase line faults. Previous to this installation power surges caused numerous operations of the relays, which was a serious matter, this being an unattended station. This type of trouble is now entirely eliminated, and since the HZ relays are rarely, if ever, called upon to clear a balanced three-phase fault, the advantage of this connection far outweighs the disadvantages.

### *Lockout device gives directional protection*

A relay engineer is almost constantly confronted with the problem of revising the protective scheme at some substation where new tie lines, or perhaps new power supply conditions, necessitate a change in relaying. Sometimes desired operations can be obtained with a little ingenuity rather than a large outlay for new equipment. A case of this kind is shown in Fig. 3. Here a 110-kv. transmission line is tapped to a step-down substation located a few thousand feet away, the distance being too short to warrant an oil switch at the transmission line end of the tap. Originally each oil circuit breaker was controlled with a set of overcurrent relays, but power conditions changed and directional relays were added in the line to Chelan, obtaining potential from existing transformers used for metering. A later change in power supply made it impossible to provide correct operation with the overcurrent relays in the line to Stemilt due to the fact that any timing chosen would cause improper operations for faults in some section of line out of adjacent substations.

The difficulty was solved by installing an instantaneous circuit-closing relay, locking out the overcurrent relays when faults occur toward Chelan. The overcurrent relays will still function as desired when faults occur on the bus or on the tap to the step-down station, as well as for faults on the line to Stemilt.

A rather novel, though simple, scheme for preventing an oil switch from operating on surges or sudden

[*Continued on page 84*]

# Revenue Up 10.4 per Cent

**September energy sales, 19.2 per cent above 1935, set new all-time record — Industrial rise continues**

NEW records are indicated by reports of operations of the electric light and power industry in September. Revenue from ultimate consumers, $175,596,900, was 10.4 per cent above the previous record for the month, scored a year ago. In addition to being a new high for September, it was the largest for any month since early in 1931, with the exception of last January. Energy production, 9,159,800,000 kw.-hr., not only constituted a new maximum for September, 18.5 per cent higher than last year, but was a new all-time high in terms of average daily output, 3 per cent above that of August. Customers numbered 690,000 more than there were a year ago; the aggregate for all classes was 25,937,755. More people are receiving service than ever before.

During the past few months the gain in revenue over 1935 has been distinctly larger than it was earlier in the year; the average from January to March was 5.7 per cent, whereas for the period from July to September it was 10 per cent. This has been especially marked in the Southeast, where business during the past few months has been from 18 to 20 per cent ahead of last year.

Energy from water power continued to be relatively low, for it constituted only 29.5 per cent of the total output. Production from fuels exceeded last year's September by 30 per cent, matched the all-time record of August and set a new mark for the average daily output 3 per cent higher than in that month.

Notwithstanding its being a short month, September brought the largest sales on record to ultimate consumers. These sales overshot those of a year ago by 19.2 per cent and ran nearly 9 per cent above last winter's peak. Every consumer group increased its demand over last year. The most striking gain was the 23.5 per cent in large commercial service. This item is now far above the pre-depression level, being 14.5 per cent higher than in September, 1929.

The average rate for residential use during the twelve-month period has dropped to 4.80 cents per kw.-hr. and consumption per customer rose to 709 kw.-hr. Both are new records.

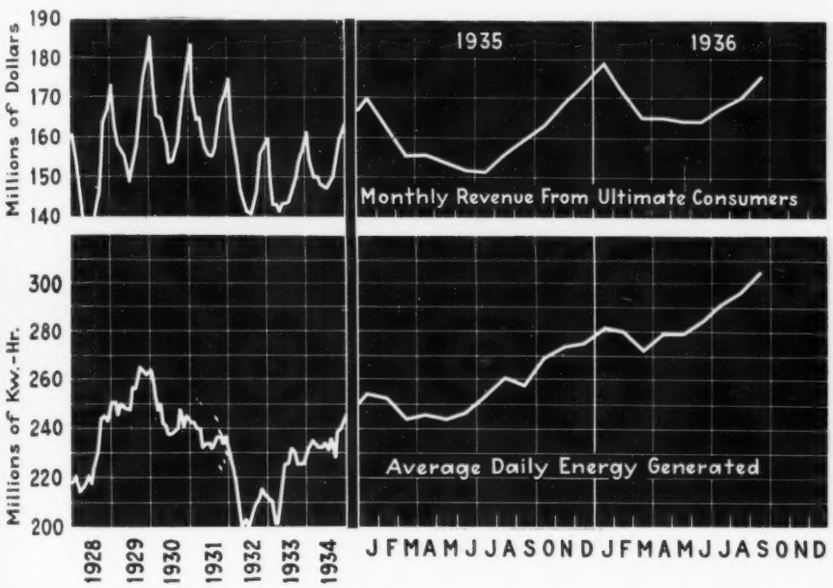



**Table I—Monthly Revenue from Ultimate Consumers and Energy Output of Central Stations in the United States**

Compared with Corresponding Month of Previous Year

| Month 1936 | Revenue from Ultimate Consumers† | | Energy Generated, Millions of Kw.-Hr.* | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | Total | | Hydro | | Fuel | |
| | Thousands of Dollars | Per Cent Inc. | Gen. | Per Cent Inc. | Gen. | Per Cent Inc. | Gen. | Per Cent Inc. |
| September | 175,597 | +10.4 | 9,160 | +18.5 | 2,735 | —2.8 | 6,425 | +30.1 |
| August | 169,630 | +8.7 | 9,178 | +13.8 | 2,756 | —10.7 | 6,422 | +28.7 |
| July | 167,672 | +10.9 | 9,067 | +15.6 | 2,832 | —14.8 | 6,235 | +38.1 |
| June | 164,007 | +8.3 | 8,592 | +14.0 | 2,996 | —7.5 | 5,596 | +34.1 |

**Table II—Regional Revenue and Energy Output in September, 1936**

Compared with Corresponding Month of Previous Year

| Geographical Region | Revenue from Ult. Consumers | | Energy Generated, Millions of Kw.-Hr.* | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | Total | | Hydro | | Fuel | |
| | Thousands of Dollars | Per Cent Inc. | Gen. | Per Cent Inc. | Gen. | Per Cent Inc. | Gen. | Per Cent Inc. |
| United States | 175,597 | +10.4 | 9,160 | +18.5 | 2,735 | —3.2 | 6,425 | +30.1 |
| New England | 14,494 | +9.7 | 597 | +13.5 | 160 | —6.5 | 437 | +23.0 |
| Middle Atlantic | 48,424 | +8.5 | 2,256 | +21.3 | 420 | —4.9 | 1,836 | +29.3 |
| East No. Central | 39,657 | +9.4 | 2,177 | +19.3 | 139 | —9.1 | 2,038 | +22.0 |
| West No. Central | 15,225 | +14.0 | 589 | +16.2 | 100 | —19.4 | 489 | +27.8 |
| South Atlantic<br>East So. Central | 24,271 | +18.0 | 1,108<br>347 | +18.2<br>+20.0 | 410<br>196 | —15.5<br>—15.6 | 698<br>151 | +57.2<br>+165.0 |
| West So. Central | 10,581 | +14.1 | 508 | +22.8 | 12 | —20.0 | 496 | +24.5 |
| Mountain | 5,413 | +7.9 | 351 | +15.9 | 264 | +10.5 | 87 | +36.0 |
| Pacific | 17,532 | +4.7 | 1,227 | +12.4 | 1,034 | +9.2 | 193 | +34.0 |

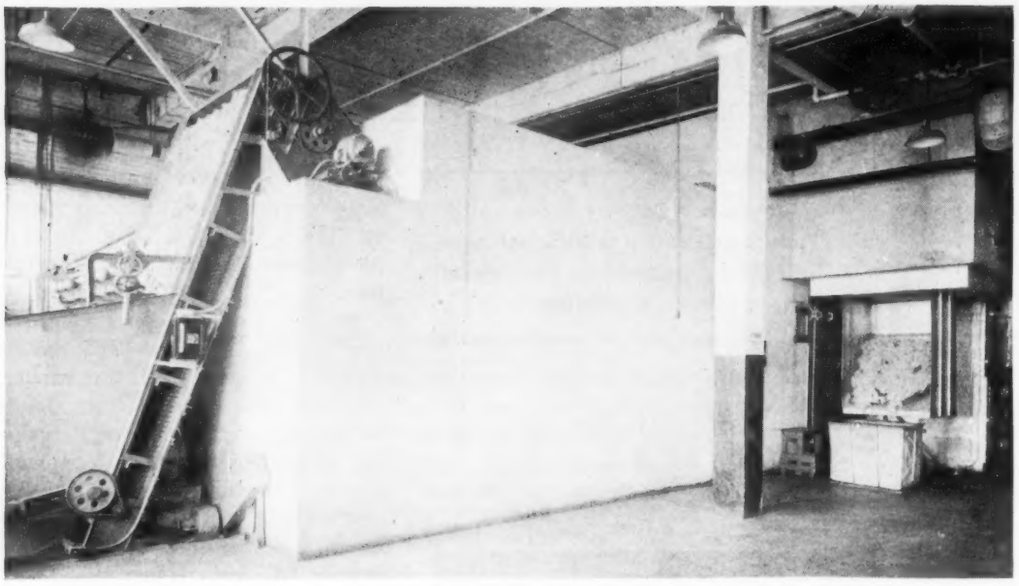
* By courtesy of U. S. Geological Survey, with deductions for operations not regarded as central station.
† Edison Electric Institute.

**Table II—Allocation of Energy September, 1936**

Compared with Corresponding Month of Previous Year
(Edison Electric Institute)

| Class of Service | Millions of Kw.-Hr. | Per Cent Inc. |
|---|---|---|
| Total for distribution* | 9,263 | +18.8 |
| Lost in transmission, etc. | 1,353 | +16.5 |
| Sold to ultimate consumers | 7,910 | +19.2 |
| Domestic | 1,261 | +11.2 |
| Com'l, small light and power | 1,402 | +17.6 |
| Com'l, large light and power | 4,540 | +23.5 |
| Municipal street lighting | 197 | +4.1 |
| Railways—street, interurban | 338 | +3.1 |
| Railroads—electrified steam | 99 | +47.9 |
| Municipal and miscellaneous | 73 | +52.8 |

* Generated, purchased from other sources, imported, less energy used in railway and other departments.



**Lowell frosted wool processing unit, showing feeder conveyor at left, insulated freezing chamber and, at the right, cleaned wool at discharge hopper**

# Cleaning Raw Wool at 35 Below Zero

## Frosting Process Uses 15 Motors Consuming 172 Hp. per Textile Unit—Cuts Costs and Improves the Quality in Worsted and Woolen Manufacture

WIDESPREAD attention has been attracted lately in the textile industry by the so-called "Frosted Wool Process" developed at the Lowell (Mass.) Textile Institute. A commercial installation has been made at the Pacific Mills, Lawrence, Mass., and a second unit is nearing completion at the East Weymouth Wool Scouring Company, East Weymouth, Mass. It is expected that the improved method available for dealing with a most troublesome problem will find wide application. Multi-motor drive features the equipment, and as the total connected load of a typical processing unit is more than 200 hp., with long-hour operating characteristics, the development has considerable electrical interest.

Four years of research at the institute preceded the adoption of the equipment as a marketable commercial unit. At Lowell the work was supervised by Prof. Edgar H. Barker, and in one year's operation about 500,000 lb. of grease wool containing various kinds and amounts of vegetable matter were treated and returned to the mills for converting into clean wool, top, yarn, woolen and worsted fabrics and hardened felt. The total operating cost of the process, including royalty, is approximately 0.75 cent per pound on the weight of wool to be processed. A full-sized cleaning unit has a capacity of from 1,000 to 1,500 lb. of grease wool per hour.

The method consists of eliminating grass, burrs, seeds, chaff, pitch, grease and earth impurities from sorted grease wool by subjecting the grease wool to a temperature of 35 deg. below zero F., with the result that the congealed or frozen wool grease is dry, hard and brittle. Neither greasy nor sticky, it is then shattered into dust by mechanical agitation (still at sub-zero temperatures), causing the fibers to separate one from another and thus allowing the vegetable matter to be thrown out through

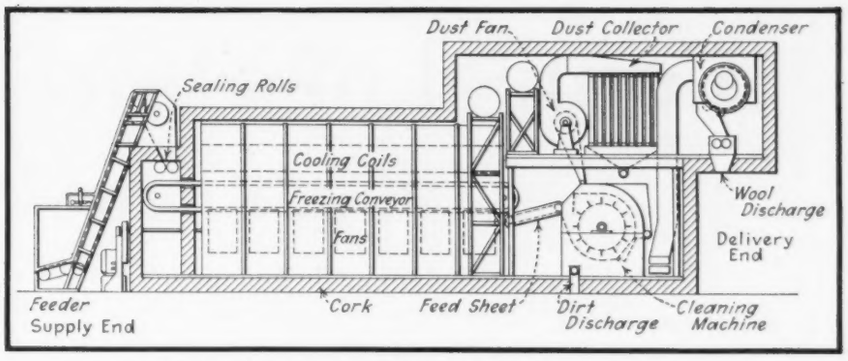
**Motors Driving Sections of Frosted Wool Unit**

| Service | Hp. Rating | R.P.M. of Output Shaft |
|---|---|---|
| Feeder | 2 | 1,200 |
| Ingoing seal | ¾ | 1,200 |
| Freezing conveyor | 2 | 4–13 |
| Processing timer | 1/20 | *1,750 |
| Feed sheet | ¾ | 57 |
| Duster | 50 | 1,200 |
| Wool conveyor | 1½ | 1,200 |
| Dust fan | 25 | 1,800 |
| Condenser and auxiliary fan | 15 | 1,800 |
| Discharge seal | 1 | 1,200 |
| Freezing fans | 15 | 1,800 |
| Cooling fans | 5 | 1,800 |
| | 118 1/20 | |
| Ammonia booster | 40 | †1,165 |
| Ammonia compressor | 50 | †1,140 |
| Cooling water pump | 3 | 3,450 |
| | 93 | |
| Total connected load | 211 1/20 hp. | |

* 110-volt, 1-phase. † Full load, slip ring. Unless otherwise noted, all motors are 550-volt, 3-phase, induction type.

the screen of a duster. The wool fiber itself cannot be frozen and extreme low temperatures have no effect on its physical structure or chemical composition. While the process does not remove all the grease, vegetable or other foreign matter from the grease wool, it eliminates from 30 to 90 per cent of the total normal shrinkage, with from 85 to 95 per cent of the vegetable matter. Only a comparatively light scouring is required after the processing. The color of the wool is greatly improved and the stain present in the ordinary scouring liquors is not retained. Savings are realized in scouring materials used; the quality of wool is improved in many ways, and its dyeing and working facilitated.

Equipment consists of a standard refrigerating unit and a refrigerating compartment containing all the cleaning machinery. The Lowell unit has a capacity of about 27 tons, which will produce and maintain an air temperature of about minus 35 deg. F. while processing the full load of from 1,000 to 1,500 lb. per hour. The refrigerating room is an insulated inclosure 40 ft. long x 12 ft. wide x 12 ft. high, with walls, ceiling and floor of 9-in. cork. It is designed for installation when desired in place of the first scouring bowl of scouring train. The grease wool is elevated and delivered by a standard feeder to the top of the cold chamber, which it enters through a pair of sealing rolls. The wool then drops upon a freezing conveyor belt 20 ft. long, with cooling coils above and fans below for circulating the air through the coils and wool.




**Longitudinal section of frosted wool process unit**

Twelve motors totaling 118 1/20 hp. are required in addition to the refrigerating plant, which adds three motors totaling 93 hp. to the connected load.

The wool remains on the conveyor from three to seven minutes, according to conditions, and at the end of the conveyor is dropped upon the feed sheet of a cleaning machine or so-called batch duster. It remains in the duster for a predetermined few seconds of mechanical agitation. The frozen foreign matter is thrown out of the wool through screens in the duster and is carried away and discharged from the room by a continuous conveyor. The cleaned fiber is intermittently discharged from the duster and is taken away by a condenser, which drops the wool into sealing rolls, through which it is discharged from the room without loss of cold air. No operator is required in the freezing chamber as the speed of the process is synchronized and controlled from without. The period of treatment in the cleaning machine, which is determined by the character and quantity of the vegetable matter, impurities, character of wool and results sought, can be instantly changed by the control setting. Photoelectric controls are used in governing the time of starting and stopping the various steps of the wool processing. In lubricating the bearings in the cold room a specially prepared grease has been found entirely satisfactory. The control provides for shutting down motors ahead of any section of the unit which is stopped, to prevent piling up of material. All motor starters are of the across-the-line type. The motors applied to the Lowell unit of the Frosted Wool Process Company are listed in the accompanying table through the courtesy of H. C. Turner, general manager.

## A BRITISH POINT OF VIEW ON T.V.A.

**The Reform Administration now in Washington was attempting, in electricity supply, to secure some knowledge regarding fundamentals. It was experimenting very considerably, and with that large conception of the American scene which condoned all waste and was not afraid to face failure and defeat, it chose as a laboratory an area in Tennessee about equal to the whole of England. We, on our side, are apt to regard such experiments with skepticism and distrust because we could not afford them, but it was of the very nature of American civilization that it should be eternally experimenting and eternally wasting, secure in the belief that some time in the future the experimenting might culminate in certainty and the original waste find its justification in a later and more abundant economic return.**
—H. HOBSON, *address before the Association of Supervising Electrical Engineers after a World Power Conference trip.*

# Control of Short Circuits Cuts Costs

## Well-Planned Sectionalizing Improved Stability, Eliminated Breaker Failures, Simplified Dispatching, Saved Cost of Larger Breakers

By H. C. TICE

Operating Engineer Southern California Edison Company, Ltd.

HEAVY concentrations of power such as are found in highly industrialized communities require continuous study to prevent excessive power flow under fault conditions. A high degree of service continuity involves complex interconnections on transmission, subtransmission and distribution systems. Inherent to such practice is the possibility of obtaining a power flow under short circuits of such a magnitude that apparatus ratings will be exceeded before the fault can be cleared, resulting in both damage to the system and prolonged service outages.

A study of conditions on the Southern California Edison Company's system revealed that, with proper sectionalizing, short-circuit kva. at important power centers could be reduced materially, in some cases as much as 75 per cent. Furthermore, sectionalizing would permit the addition of 850,000 kva. of generating capacity and 350,000 kva. of condenser capacity without exceeding the interrupting capacity of important circuit breakers in the key switching centers on the system.

Control of short-circuit kva. on the Edison system can be explained more clearly by referring to the accompanying schematic diagram of the transmission system. The "backbone" of the Edison system is essentially a transmission system with 220 kv. for major transmission and 66 kv. for subtransmission. A large amount of synchronous condenser capacity is required for power-factor correction and voltage regulation. This capacity adds materially to the short circuit kva. available at any given point on the interconnected system.

For example, the total generating capacity is 950,000 kva. and the total synchronous condenser capacity is 550,000 kva., so that the total capacity to be considered under short-circuit conditions is 1,500,000 kva. More than half of this capacity is concentrated at the five major distributing points, which are located within a radius of 20 miles.

It is within this area that short-circuit control has been a real factor. The first step was to sectionalize the 66-kv. system within this area into four major groups, interconnected only through the 220-kv. system. This was accomplished by sectionalizing the 66-kv. system, which normally operated as a closed loop, at such points as Macneil, Beverly, Newmark, Torrance, etc. This was quite simple, as each one of those key stations was already equipped with double bus and a pair of oil circuit breakers per line, and it was largely a matter of selecting the proper lines and loads for each separate group. This arrangement was found to be very satisfactory as to loading of lines, voltage conditions, relay protection and reduction in short-circuit kva. Such stations as Torrance, Beverly, Macneil and Newmark dropped from 1,500,000 kva. to half of that value, which brought the short-circuit kva. within the rating of the oil circuit breakers. The next step was to sectionalize the 66-kv. buses at such major stations as Eagle Rock, Laguna Bell and Lighthipe. This required further sectionalizing on the 66 kv. in order to create six separate 66-kv. groups instead of three.

Maximum capacity on any group is 150,000 kva. of interconnection with

### Table I—66-Kv. System

| Station | Column I 3-ph., Short-Cir. Kva. with 1,500,000 Kva. Syn. Cap. System Normally Sectionalized | Column II Same as Column I without Sectionalizing | Column III 3-ph., Short-Cir. Kva. with 850,000 Kva. of Gener. & 350,000 Kva. of Syn. Cond. Cap. Added to Pres. Cap. System Normally Sectionalized Total Cap. 2,700,000 Kva. | Column IV Same as Column III without Sectionalizing |
|---|---|---|---|---|
| Laguna Bell | 990,000 | 1,900,000 | 1,050,000 | 2,280,000 |
| Lighthipe | 860,000 | 1,900,000 | 1,400,000A | 3,100,000 |
| Long Beach No. 2 | 790,000 | 1,745,000 | 1,110,000 | 2,700,000 |
| Eagle Rock | 740,000 | 1,800,000 | 770,000 | 1,980,000 |
| La Fresa | 775,000 | 1,550,000 | 600,000B | 2,150,000 |
| Newmark | 705,000 | 1,550,000 | 760,000 | 1,800,000 |
| Torrance | 670,000 | 1,540,000 | 540,000C | 2,130,000 |
| L. A. No. 3 | 610,000 | 1,180,000 | 630,000 | 1,300,000 |
| Puente | 580,000 | 1,140,000 | 600,000 | 1,300,000 |
| Chino | 565,000 | 885,000 | 580,000 | 960,000 |
| State Street | 550,000 | 1,400,000 | 740,000 | 1,950,000 |
| Katella | 510,000 | 870,000 | 640,000 | 1,050,000 |
| Saugus | 505,000 | 7,790,000 | 530,000 | 840,000 |
| Glendale | 495,000 | 1,220,000 | 515,000 | 1,300,000 |
| Colton | 450,000 | 590,000 | 450,000 | 620,000 |
| Macneil | 290,000 | 1,200,000 | 270,000 | 1,350,000 |
| Beverly | 250,000 | 1,000,000 | 265,000 | 1,240,000 |

A—Two 75,000-kva. banks, two 50,000-kva. condensers per section can be reduced to 700,000 kva. by further sectionalizing.

B—66-kv. buses sectionalized. One 75,000-kva. bank, one 50,000-kva. condenser, as compared with two 75,000-kva. banks, one 50,000-kva. condenser. Column I

C—Result of change at La Fresa.

the 220 kv. and 150,000 kva. of synchronous condenser capacity. The minimum capacity consists of a 75,000-kva. bank of transformers and 50,000 kva. of synchronous condenser capacity. The maximum short-circuit kva. that can now be obtained on a 66-kv. bus is 990,000 kva., as compared with 1,990,000 kva. before the separation. The reduction in short-circuit kva. within this area is shown in Table I.

Column I of this table shows the maximum short-circuit kva. available on a three-phase fault under normal conditions of operation; that is, all sectionalizing points normally open. Column II shows the maximum short-circuit kva. available on a three-phase fault before any attempt was made to reduce the short-circuit kva.

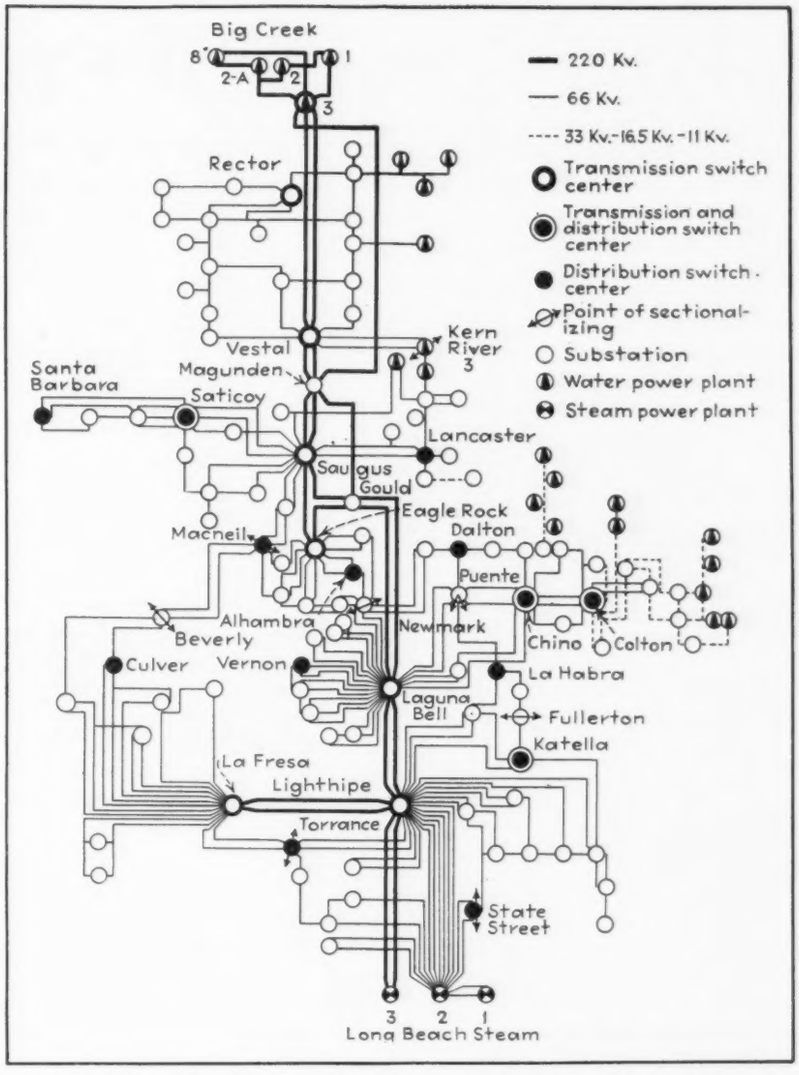
### *A marked reduction in short-circuit kva.*

A comparison of columns I and II shows the marked reduction in the maximum short-circuit kva. available with the present installed capacity. The reduction ranges anywhere from two to one at the major stations to four to one at the sectionalizing points.

Column III shows the short-circuit kva. available by increasing the generating capacity by 850,000 kva., and the synchronous condenser capacity by 350,000 kva., giving a total capacity of 2,700,000 kva. In other words, by practically doubling the present capacity the short circuit is still within the rating of the oil circuit breakers. In the case of Lighthipe it may be necessary to sectionalize into four 75,000-kva. groups instead of two 150,000-kva. groups. This would then limit the short-circuit kva. to less than 1,000,000. Column IV shows what might be expected in the way of short-circuit kva. with a 2,700,000-kva. system and parallel operation.

The breakers at the major stations are rated at 1,500,000 kva. However, at many of the close-in 66-kv. stations breakers are rated from 500,000 kva. to 1,000,000 kva. Experience has shown that it is well to keep the short-circuit kva. considerably below the theoretical rating of the breakers.

With the plan as outlined for the 66-kv. system, it is an easy matter to limit the maximum short-circuit kva. to 1,000,000 kva. even after doubling the present installed capacity. This plan of operation has resulted in the minimum number of switch changes, and the cost of obtaining this short-circuit control is negligible because there has been no additional equipment installed for this purpose alone. At such stations as Eagle Rock, Laguna Bell and Lighthipe, with from 20 to 30 66-kv. line positions, bus sectionalizing switches are normally installed to sectionalize automatically the buses in the event of a bus failure.




**Planned sectionalization of Southern California Edison System**

It is the double-bus arrangement and bus-sectionalizing switches that give the system sufficient flexibility to carry out this scheme of short circuit control.

This particular method of operation on the 66-kv. system has proved to be quite simple, effective and inexpensive, and it appears to be the logical course to follow on the 220 kv. as additional capacity is installed and short-circuit kva. control becomes necessary. Up to this time the only control on the 220 kv. has been that of ground current. The later transformers have been specified with 73 kv. neutral insulation and have reactors or impeders installed in the 220-kv. neutrals. The effect of this control is barely noticeable on account of the large amount of transformer capacity that is solidly grounded. The effect of reactors in 345,000 kva. of transformer capacity has been to reduce the total ground current from 5 per cent at Laguna Bell switching center to 10 per cent at Long Beach No. 3 steam plant.

### *Scheme for limiting 220-kva., three-phase faults*

Records for 1929 and 1930 indicate that 17 per cent of all 220-kv. trouble involved more than one phase and that 6 per cent involved all three phases. This means that short-circuit kva. control on the 220 kv. must be considered under three-phase fault conditions. The values of three-phase, short-circuit kva. on the 220 kv., as shown in column I of Table II, are up to and, in some cases, in excess of the rating of the present breakers. Column II shows the

short-circuit kva. that can be expected by increasing the present synchronous capacity from 1,500,000 kva. to 2,700,000 kva. These values are 100 per cent in excess of the rating of the present breakers, and it will be necessary to have some control over the maximum short-circuit kva.

One scheme for the 220-kv. system consists in establishing four 220,000-kw. load centers supplied directly from Long Beach No. 3 at 220 kv. Each load center is sectionalized on the 66 kv. with 100,000-kva. transformer units per section as the normal feed. Each section is also interconnected with the 220-kv. system through 75,000 kva. transformer units. These units serve as a point of exchange and an alternate feed for each group. In each case there are two banks per line interconnected on the 66 kv. only. The short-circuit kva. for such an arrangement is given in column III, Table II, for a total system capacity of 2,700,000 kva. These values are practically the same as the short-circuit kva. at the present time with 1,500,000 kva. of capacity. Such an arrangement results in a practical and extremely flexible arrangement on the 220 kv. and permits doubling the present capacity without increasing the short-circuit kva. beyond the rating of the present breakers.

The distribution system requires an equal amount of study in order to obtain the desired results at the minimum cost. Distribution substations such as Vernon on the 16 kv. and State Street on the 11 kv. have a capacity of 30,000 kva. with maximum short-circuit values of 320,000 kva. at Vernon and 250,000 kva. at State Street. In each case the feeders are relatively short and heavily loaded and in order to protect the equipment at consumers' stations and out on the line it is necessary to limit the short-circuit kva. to 100,000 and less. In such cases 300-amp. 5 per cent line reactors are installed which limit the short-circuit kva. at Vernon to 120,000 kva. and at State Street to 80,000 kva. In these two cases it was necessary to resort to line reactors in order to limit the kva. to the values shown; however, in many other cases the short-circuit kva. can be held within the required limits by installing one bus sectionalizing switch and operating the transformers separately instead of paralleled operation. In such cases line reactors are not needed and quite a saving is effected. There is a total of 410 16-kv. and 11-kv. circuits on the Edison system, 38 per cent of which are equipped with line reactors.

**Table II—220-Kv. System**

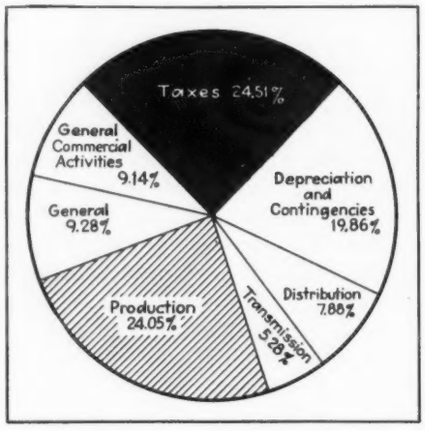
| Station | Column I<br>3-ph. Short Cir. Kva. with Present Capacity of 1,500,000 Kva. Parallel Operation | Column II<br>3-ph. Short-Cir. Kva. with a Total Capacity of 2,700,000 Kva. Parallel Operation | Column III<br>3-ph. Short-Cir. Kva after Rearranging Lines & 220 Kva. Interconnections. Total Cap. 2,700,000 Kva. |
|---|---|---|---|
| Magunden | 1,840,000 | 2,095,000 | 1,940,000 |
| Saugus | 1,860,000 | 2,400,000 | 2,020,000 |
| Gould | 2,290,000 | 3,160,000 | 2,600,000 |
| Eagle Rock | 2,170,000 | 3,100,000 | 2,440,000 |
| Laguna Bell | 2,480,000 | 4,500,000 | 2,340,000 |
| Lighthipe | 2,490,000 | 5,100,000 | 2,300,000 |
| Long Beach No. 3 | 2,400,000 | 5,400,000 | 1,460,000 |

In summing up the subject of short-circuit control on the Edison system it is evident that almost any degree of control can be obtained by simply operating a number of small units instead of large concentrated blocks of power; second, that the cost of obtaining such control is negligible compared with the beneficial results that are obtained by operating in such manner; third, group operation on the 66 kv. has eliminated the heavy short-circuit kva.'s that formerly caused instability of the 220-kv. system and thereby has greatly improved the quality of service; fourth, oil circuit breaker failures have been practically eliminated and the cost of overhaul and maintenance reduced to a minimum; fifth, group operation has simplified dispatching to such an extent that it is possible to dispatch all operations through the medium of switching centers in each group, thereby eliminating all-time delay in restoring service following an interruption; sixth, another outstanding benefit of group operation is the improvement that was obtained in the performance of the protective relays, but, most important of all, the quality of service has been improved and the cost of electrical energy to the consumer has been reduced.

## Taxes Exceed Production Costs

**Taxes constitute a larger fraction of total operating costs than production expenses and are nearly twice as large as transmission and distribution costs combined, it appears from the analysis of one company's operations during 1935 depicted in the chart. The territory served is in the eastern United States. Plants are large and efficient and transmission distances are of considerable length.**

**It is seen that production costs are less than one-fourth of the total. While depreciation and contingencies appear to bulk large, amounting to 20 per cent of total costs, they are equivalent to less than two per cent of the capital investment represented by stock and funded debt.**




*Distribution of one company's operating costs, 1935*

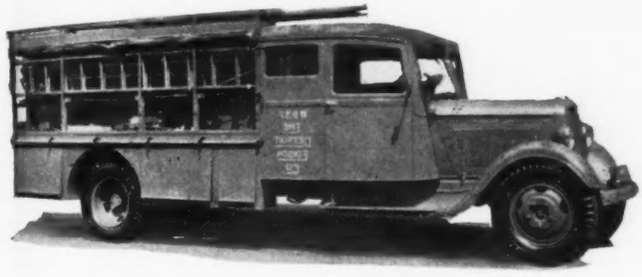
# Latest Styles in Line Trucks

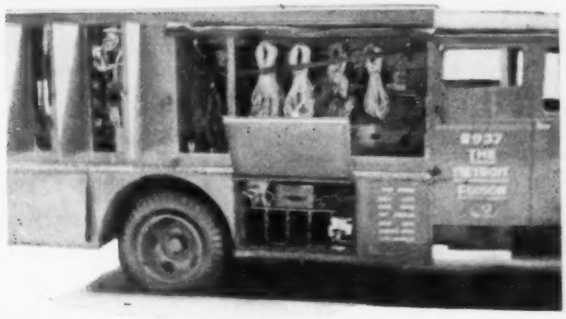
**Modern thinking in line truck design was recently displayed in Detroit. The exhibits were furnished by the Detroit Edison Company and Consumers Power Company and are assembled here for the larger audience of Electrical World readers**

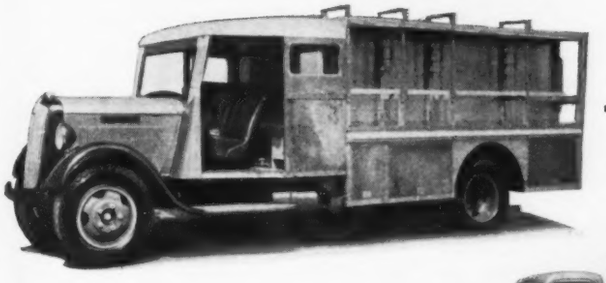
POLE-HOLE DIGGER—Combination earth-boring machine and pole-setting truck. Short wheelbase, rugged, 11,000-lb. chassis with pneumatic lug or tractor type tires. Gross weight only 7,000 lb. for negotiating soft or rough ground—Consumers Power Company.

HEAVY LINE TRUCK—A general-purpose construction truck with combination seven-man cab and large all-metal body mounted on a 13,000-lb. chassis completely equipped with power-operated winch, derrick, metal bins, tool compartments and supports—Consumers Power Company.

EARTH-BORING MACHINE—Mounted on six-wheel truck with four-wheel drive. Weight, 11,740 lb. with pole derrick and winch for 5,000 lb. pull. Road speed is 35 m.p.h.—Detroit Edison.

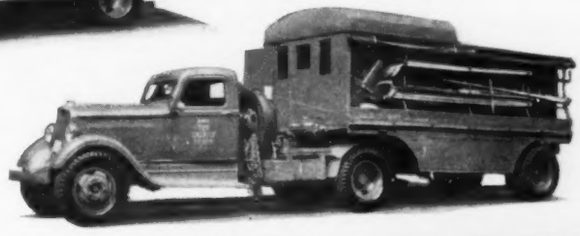






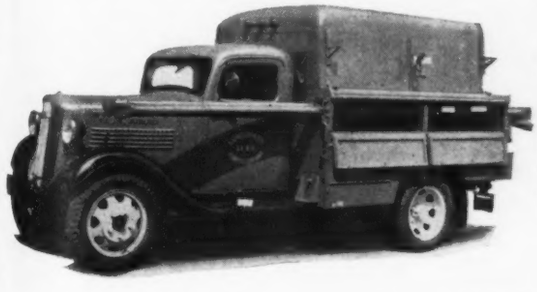
LINE CONSTRUCTION TRUCK—Light alloy body mounted on Model K48 Dodge chassis. Wheelbase 190 in. Weight, complete, 7,500 lb. and load capacity, 6,000 lb. At the left appears the truck with body under construction. At upper left and above are the completed vehicle loaded, road and curb sides respectively.—Detroit Edison.

CONSTRUCTION TRACTOR AND SEMI-TRAILER—Standard trailer chassis with light alloy body. The complete trailer weighs 6,000 lb. and has a carrying capacity of 9,000. There is space for eight men in the closed cab.



LIGHT LINE TRUCK—This machine has a 7 x 9-ft. all-metal body mounted on a 1,000-lb. chassis with standard cab and provided with carefully designed compartments for line tools, hardware and equipment—Consumers Power Company.

CLOSED CAB—the two pictures of the road and curb sides of the trailer open show disposition of tools and equipment—Detroit Edison.



# Appliance Sales Keyed to Market Analysis

## Brooklyn Charts Its Area in Economic Detail — Dealers Aided Toward Profitable, Intensive Promotion in Selective Districts

By GEORGE J. READ . . . SHERMAN M. HALL

Consolidated Edison Company of New York, Inc.

*Coaching the dealer in his selling campaigns is far more effective when he can be shown specifically what to sell, where to sell and advertise it and toward what bogey. Brooklyn digests the cold facts of the "real property inventory" to make a lively presentation of marketing opportunities for load-building appliances for its circle of dealers.*

TO GAIN an accurate picture of the appliance market and to enable dealers to direct their sales efforts more efficiently in a city of 2,700,000 people covering 81 square miles the Brooklyn Edison Company has recently prepared a 74-page "Brooklyn Market Survey." The analysis of the market is divided into two parts. The total market as a whole is analyzed by means of graphs and tables. The geographical distribution of the market is shown in a series of 40 colored maps dividing the city into 59 districts and 928 small census tract areas.

The present trend in utility appliance merchandising is toward gradual withdrawal of active company selling, leaving this field to the local dealers. Aggressive promotion and real co-operation with the dealers must take its place to keep up the volume of appliance sales. The electric utilities can draw a valuable lesson from their contemporaries in the business field when it comes to scientific merchandising. Market research is the modern approach to efficient merchandising and is being employed to an ever-increasing extent by those marketing goods in the competitive market.

### *Market research necessary*

Market research answers the question as to when, where, how, whom and what to sell. It involves the study of consumers' characteristics to find out where the profitable and unprofitable areas are located. It forms the basis for sound judgment in planning sales campaigns, setting quotas and sales potentials. It is like shooting with a rifle instead of a shotgun. Sales efforts can be concentrated on profitable areas, and not diluted by broadcast, frontal attack.

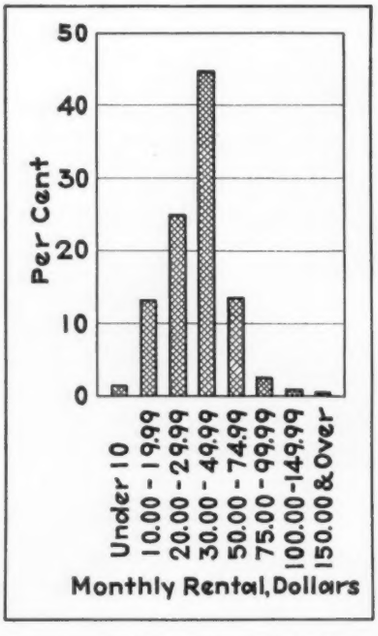



**Fig. 1—Analysis of rentals shows 44 per cent in $30 to $50 class**

Bar chart shows greatest number of family quarters in $30 to $50 class. Next highest is $20 to $30 class with 25 per cent. These two altogether account for 69 per cent of the total. Median average rental for Brooklyn is $35 monthly.

Why is market research necessary? If sales efforts are not to be diluted, they must be concentrated on the people who have the means to buy and to utilize the product. But where do these people live, how many are there, what kind of family quarters do they occupy, what is their purchasing power, how does it vary in different sections of the city? Effective merchandising demands an answer to these. Market research furnishes the answer.

Aside from those directly interested in merchandising electrical appliances, specific requests have come from local banks, real estate men, city officials, broadcasting stations, bonding and insurance companies, manufacturers and newspapers. Such a survey not only is valuable directly to the utility, but builds good will through rendering a valuable service to consumers in their business. By furnishing detailed data on the market it serves as an aid in retaining industry and attracting new industry to the city.

### *Survey divided into twelve sections*

So that others interested in market analysis may get an idea of what can be done in this field, an outline of the scope of the survey is given. The analysis of the market is divided into two parts; first, the city as a whole, and, second, the geographical distribution over the city. The survey is divided into twelve sections, each with its distinguishing colored heading. These sections, with an outline of the field covered, are given briefly as follows:

*1. Market Research*—As market research is comparatively new, it was thought necessary to devote some space to definition, showing its necessity in modern merchandising, and outlining some of the uses to which it could be put and telling who could use it.

*2. Application of the Survey*—This market survey is a basic source of market data to be studied and used as a reference book. In addition to aiding in formulating sales and advertising campaigns it can be employed as a guide in direct mail campaigns, location of stores, appraisal of real estate, future development of the city. For any specific promotional program, however, a special study should be made, using the survey as the source of data.

As the survey will fall into the hands of many who are not trained in market analysis it was considered necessary to devote considerable space to illustrating the use of the data. For purposes of illustration a hypothetical electric washing machine distributor is taken and the various charts and maps used to outline his market.

Before a sales campaign is begun the sales manager and executives should know what the total available market is, and have an idea of the total probable market. Obviously the mximum theoretical number of washing machines that could be sold would be one to each family, although no one expects to reach that value. Sales efforts will be measured in terms of this value.

Suppose this dealer wishes to concentrate on the cream of the market first. He begins by selecting those customers with sufficient purchasing power to qualify as prospects. He decides, let us say, to concentrate his efforts on those families paying more than $30 rent per month. By the use of the charts and tables he finds that there are, taking Brooklyn as the example, 324,876 rented family quarters renting for more than $30 monthly. He qualifies this further by limiting it to only occupied family quarters, which he finds to be 297,478. He next adds to this figure the total number of owner-occupied quarters (151,879), assuming that the fact of home ownership itself is enough qualification of a prospect. Finally, then, he has the total market, amounting to 449,357 family quarters.

But this is not enough. Next he wants to know where these prospects are located in the city. The first selection is that of areas where one- and two-family houses predominate, for multi-family housing offers little room for washers. When suitable areas have been selected for sales effort concentration on the basis of housing, they should be further selected on the basis of buying power or rentals. With the areas now segregated, the market can be evaluated in terms of prospects, using the number of family quarters in each of the areas selected.

The use of the survey is discussed for various specific applications, such as ranges, refrigerators, oil burners, home lighting, domestic air conditioning, commercial air conditioning, lighting and cooking.

*3. A City of 28 Communities*—Brooklyn, a city of 2,700,000 people, representing 2 per cent of the population of the United States and 20 per cent of the population of New York State, divides itself naturally into 28 districts, each with distinct characteristics of its own. These 28 districts, the outgrowth of a number of separate towns originally, are shown on a map and each is described in point of population and industry.

*4. Population*—Eight pages are devoted to population analysis. The growth for the past hundred years is traced and compared to that of the nation. The population is analyzed as to composition, gainfully employed workers and size of households.

**Fig. 2—Rental map shows distribution of purchasing power**

Predominant median monthly rental is shown for 928 census tract areas. This map permits selection of the best prospects, showing their geographical location and relative economic standing. This sample shows about one-fourth the city area. It gives no impression of the aid lent by differential coloring of the original.

Headings, paragraph titles and bar charts are colored, a distinctive color being used for each section of the book with an appropriate symbol for identification. Pages are 11 x 14 in. and are bound with spiral binding. It contains 74 pages, is ⅝ in. thick and weighs 3 lbs. "Reddy Kilowatt" holds the page numbers.

Geographical distribution of population is shown on a series of four maps. Study of the maps reveals a distinct movement of population from the older, and more thickly settled section which is becoming industrial and commercial, to the outlying residential sections. An interesting situation was revealed. As a whole the population increased 27 per cent from 1920 to 1930, but of the 23 assembly districts, fifteen showed a decrease and eight an increase. Those areas which did increase showed a substantial increase, often in the order of magnitude of 100 per cent.

*5. Rentals Show Purchasing Power*—Income or consumers' buying power is the most desirable and at the same time the most difficult item to obtain. About the only approach is rental, which varies from approximately 30 per cent of the income in the lower income brackets to 10 per cent in the higher income brackets. The median average rent has been calculated for each census tract, for each district and for the total territory.

Rentals as a whole have been analyzed in four bar charts which show the per cent of family quarters in the various rent groups. The titles of these charts are self-explanatory: "Rental of Occupied Family Quarters," "Rent per Room for Rented Occupied Family Quarters," "Rental of Vacant Family Quarters," "Rental of Occupied Family Quarters" (cumulative told by groups). Rental of occupied family quarters is illustrated in Fig. 1.

The two maps showing rentals, one by 59 areas for the general picture and the other by 928 census tracts for detailed use, are considered the most valuable in the survey. Approximately 14,000 calculations were involved in preparing these two maps. Two other maps show by blocks where the predominant median rental exceeds $40 per month and where it exceeds $60 month. A fifth map shows the actual number of quarters in each of 59 areas classified by rental groups. A section of the census tract area rental map is reproduced in Fig. 2. In the survey the map is shown in five colors, dividing the rentals into five groups covering values from zero to $60 monthly.

*6. Data on Family Quarters*—While rent paid is a direct indication of income, supplementary data concerning the living conditions of the family group give important clues to the relative wants of the people. Family quarters are analyzed by size, geographical location, ownership, type of structure and equipment. Bar charts show the per cent distribution of size of quarters by number of rooms for rented-occupied family quarters, owner-occupied family quarters and vacant quarters. A comparison of occupied and vacant quarters is made with respect to mechanical refrigeration, condition of structures, rent, central heating plants, gas and electricity and other items. It is interesting to note in comparing vacant and occupied quarters that 93 per cent of the quarters with mechanical refrigeration were occupied. Distribution of rented-occupied family quarters is shown in Fig. 3.

The geographical distribution of family

quarters and their characteristics for the large and small areas are shown in sixteen maps. A list of titles gives their scope: "Number of Occupied Family Quarters," "Percentage of Family Quarters Occupied by Owner," "Number of Owner-Occupied Family Quarters," "Number of Family Quarters in One- and Two-Family Structures," "Percentage of Family Quarters With Mechanical Refrigeration," "Number of Family Quarters with Mechanical Refrigeration," "Percentage of Family Quarters Without Central Heating Plants," "Number of Family Quarters Without Central Heating Plants."

A brief study of the map showing number of mechanical refrigerators shows a higher density in apartment house areas, and lower in areas where one- and two-family houses abound. The map of census tract areas shows several areas where the saturation exceeds 90 per cent and others where the saturation reaches zero, illustrating the extreme variation.

### *Residential structures and commercial market*

Residential structures have been analyzed as to type, age, condition, geographical distribution. Percentage distribution of structures into one-family, two-family, multi-family and other classifications is shown by bar charts for total structures, total family quarters, vacant family quarters, and for age and condition. Of all the family quarters in Brooklyn, 55 per cent are in multi-family structures.

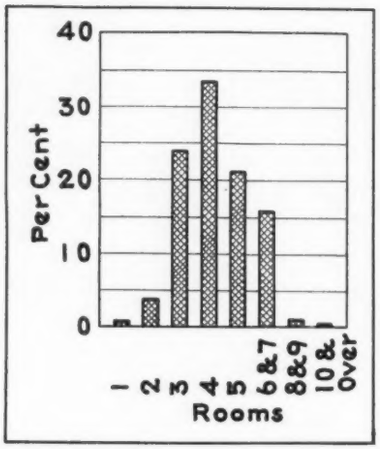



**Fig. 3 — Number of rooms per rented-occupied family quarter aids in lighting and air conditioning surveys**

Four-room quarters are 34 per cent. Three-fourths of the quarters are from three to five rooms. Eighty-two per cent are five rooms or less and 61 per cent are four rooms or less.

Blocks where one- and two-family houses predominate are shown on a map. Three maps show respectively by number of structures the type, condition and age of the structures.

Historical data back to 1912 are shown for 25 areas of the city enumerating structures and classifying them as follows: One-family, two-family, apartments without elevators, apartments with elevators, warehouses, lofts, office buildings, factories, garages and theaters. These were obtained from the city records.

To aid in selling commercial lighting, air conditioning and similar equipment an analysis of the geographical distribution of commercial establishments is shown. These maps, showing the number of establishments by 928 small areas, are: Number of food stores, general merchandise stores, restaurants and lunchrooms, drug stores, apparel stores, furniture and household appliance stores and service stores. The distribution for the year 1934 of non-residential structures over the city, such as lofts, offices, warehouses, etc., is shown on two maps.

It is always interesting to compare one's own city with others and frequently by this process valuable conclusions are drawn. Brooklyn has been compared with nineteen cities covering all sections of the nation. This includes family quarter characteristics, rentals, owner occupancy and racial characteristics of the population.

### *Data available for other cities*

The Real Property Inventory of New York City and the U. S. Bureau of the Census constitute the sources of the data upon which the Brooklyn Market Survey is based. In 1934 a Real Property Inventory of New York City was made under the direction of the New York City Housing Authority, U. S. Department of Commerce and the Mayor's Advisory Committee on Real Property Inventory and was released in 1935. A force of approximately 5,000 enumerators and compilers was employed at a cost of approximately $5,000,000, which was borne by the city of New York, State Emergency Relief Administration and the Federal Emergency Relief Administration. The project was undertaken primarily as a relief job for white collar workers. Similar inventories are available for 64 representative cities of the country, being pub-

[*Continued on page 92*]

**Fig. 4—Per cent saturation of mechanical refrigerators highest in apartment house areas**

Maps of number and per cent saturation of mechanical refrigerators show good market still available in one- and two-family house areas. Average saturation for city is 25%.

# Welder Energy Supply a Service Problem

## Welding Load May Pop Up Anywhere—Low Revenue Often Makes Large Service Investment Precariously Profitable Unless It Is Amplified

*The electric welder is becoming popular. Its use is no longer confined to large industrial plants. Small job shops, garages and even basement mechanics are using it in increasing numbers. And what a few unrestrained welders can do to distribution system regulation is a plenty. Here's how one utility handles the situation.*

**By A. L. LANE**

Detroit Edison Company, Detroit, Mich.*

WITH the rapid progress that is being made in the electric welding art and the consequent extension of welding both to new uses and to new users the problem of voltage fluctuations is becoming acute. Time was, not so long ago, when electric welding was a recondite art, its application confined to special purposes pretty well submerged in large industrial operations. But now welding is replacing rivets and bolts in the small job shop at the end of the street, in the garage around the corner and is being discovered by the home mechanic who descends to his basement shop after supper and irritates a whole neighborhood with flickering lights.

The average customer who buys a welding machine will have a small three-phase motor load and lighting on single phase. He will be served from a 230-volt, three-phase secondary. He may go right ahead and use the welder or he may inquire of the power company as to service for it. In the former case the utility may never know of it unless his neighbors complain of voltage fluctuations. However, if he inquires as to its installation the power sales engineer should try to determine from the nameplate rating and the type of welding work what the load will be and how much voltage disturbance it is likely to cause. In Detroit it is accepted that voltage disturbances on lighting circuits should not exceed 1½ volts. It is plain that the matter of welder rating is very important from the utility standpoint, but unfortunately there seems to be little agreement among welder manufacturers on this point.

In many cases additional transformer capacity must be installed on the power company's line. If the single-phase welding load is installed on the customer's regular three-phase power service and the three-phase transformer capacity increased the power company will not receive sufficient revenue because the welder energy consumption is too low to warrant the investment unless a charge for the additional transformer capacity is made.

A study of approximately fifty installations, of which a typical few are shown in the accompanying Table I, indicates that the average consumption is 3.3 kw.-hr. per month per kva. of transformer capacity required, and from this, at 3 cents per kilowatt-hour, a revenue of 10 cents per month would be obtained. One kva. of transformer capacity serving a motor load with only a 10 per cent load factor would produce a revenue of $2.16 per month, or more than 21 times that of a welder load. It is apparent that in the majority of installations the current consumption is so low that an expenditure by the utility for capacity is not justified unless some special minimum charge, based on welder rating or the transformer capacity required, is made.

**Table I—Service To and Revenue From Small Welders**

| Type of Welder and Capacity | Transf. Capacity Required Kva. | Average Monthly Consumption | Average Revenue at 3c per Kw.-Hr. |
|---|---|---|---|
| 10 kva. arc | 5 | 6 | 0.18 |
| 15 kw. spot | 10 | 115 | 3.45 |
| 90 amp. arc | 15 | 25 | 0.75 |
| 2–20 kva. spot | 25 | 100 | 3.00 |
| 150 kw. spot | 50 | 220 | 6.60 |
| Welder testing | 75 | 30 | 0.90 |
| 200 kva. spot | 100 | 800 | 24.00 |
| 400 kva. butt | 300 | 300 | 9.00 |
| Welder testing | 500 | 3000 | 90.00 |

At a nominal energy rate the revenue from a welder is obviously too little to pay the cost of serving it. Correction of this condition and also, what is even more important, the cure of voltage disturbances caused by the welder are accomplished by hanging a special transformer, for which a charge based on capacity is made.

### *Hang a special transformer*

In Detroit we have adopted the policy of hanging a special transformer on the distribution circuit for welder use only, thereby completely isolating the welder load from the secondary lines serving other customers. We make a special minimum charge based upon the size of transformer required and, when the characteristics of the load and its effect on the service to other customers are explained, the prospective welder user is usually agreeable to such an installation and wires a separate service pipe and entrance switch. The agreement for that service is a special rider attached to the power contract which provides for a minimum charge based on the transformer capacity made necessary.

Having the information as to the load and some experience as to prob-

[*Continued on page 94*]

* Arranged from paper to Great Lakes Power Club.

# Stores Need Modernization

## Survey Shows Poor Lighting, Lack of Signs; Points Way for Local Studies

OPPORTUNITIES for the electrical industry in retail store service are disclosed in a Department of Commerce report, giving the results of a survey of 8,108 retail stores in 23 cities by the Marketing Division of the Bureau of Foreign and Domestic Commerce. These results are of interest to the electrical industry because it is directly concerned in several of the items considered.

"Good appearance and efficient layout, lighting and equipment are among the most effective tools in store operation," the report points out. "A large majority of the stores observed do not have good exterior electric signs. Drug stores and restaurants appear to be the most consistent users of such outside signs. The value of ample lighting, both outside and inside, cannot be overemphasized as a merchandising asset."

Among the conclusions drawn from the survey are these:

Only 34 per cent of the establishments have outside electric signs, including neon, although 72 per cent of the drug stores have such signs.

Mechanical refrigeration is found in 76 per cent of the drug stores, 72 per cent of grocery stores and 61 per cent of the restaurants.

The observers who collected the data were asked to make recommendations for improving the appearance of the stores. They found that nearly 29 per cent of the stores should have the lighting fixtures replaced or added to. In the case of grocery stores the percentage ran up to 35. Even of the drug stores, which in general had a good appearance, one in four needed better lighting.

That the recommendations as to lighting were conservative is apparent from a study of the table headed "Modernization Needs by Kinds of Business," abstracted from a more comprehensive one in the report. In the opinion of the observers, the window lighting, for example, was unsatisfactory in only a few per cent of the stores. This is a considerably higher "batting average" than most lighting specialists would concede.

A word of explanation should be added regarding this table. The two columns headed "Outside Signs" do not, apparently, refer only to electric signs. They are here included as affording the only clue to the condition of store signs.

### *Suggestions for power companies*

No reference is made to air conditioning. On this point the report states: "This recommendation was not included in the schedule . . . for notwithstanding its being a much-needed improvement for most stores, air conditioning is still out of reach of many small stores because of the cost involved."

The report concludes with a suggested and much more detailed check list as a guide for independent surveys relating to modernization. The items referring to signs, window and interior lighting could be used to advantage by power companies for a study of prospects in this field.

Copies of the report, which is designated "Store Modernization Needs, Market Series No. 8," are obtainable at 10 cents each from the Bureau of Foreign and Domestic Commerce, in Washington, or from any one of its 25 district offices.

**Table I—Facilities and Features**

**8,108 Stores in 23 Cities**

| Kind of Business | Per Cent of Observed Establishments: Elec. or Neon Signs | Lighted Cases | Elec. Refrigeration |
|---|---|---|---|
| 1226 Grocery stores | 15 | 39 | 72 |
| 479 Other food stores | 29 | 17 | 39 |
| 298 General mdse | 26 | 26 | 13 |
| 694 Apparel stores | 38 | 30 | 3 |
| 944 Automotive group | 44 | 3 | 3 |
| 267 Furniture group | 30 | 6 | 5 |
| 460 Hardware and bldg | 32 | 11 | 3 |
| 1128 Restaurants, etc | 57 | 6 | 61 |
| 85 Cigar stores | 29 | 23 | 30 |
| 420 Drug stores | 72 | 36 | 76 |
| 143 Jewelry stores | 49 | 44 | — |
| 112 Stationery and book | 23 | 24 | 11 |
| 327 Misc. retail | 18 | 17 | 14 |
| 579 Barber, beauty shops | 24 | 3 | 2 |
| 592 Cleaning and pressing | 24 | 4 | 1 |
| 324 Mechanical service | 22 | 3 | 2 |

**Table II—Modernization Needs**

**8,108 Stores in 23 Selected Cities**

| Modernization Recommendations | Per Cent Needing Modernization |
|---|---|
| **Exterior** | |
| Outside signs | |
| Install or replace | 17.8 |
| Paint or repair | 4.4 |
| Windows | |
| Replace, add to or install new lighting | 1.8 |
| **Interior** | |
| Lighting fixtures | |
| Install new or additional | 28.9 |
| Departmental neon signs | |
| Install* | 8.3 |
| Ventiliating equipment | |
| Install | 10.1 |

*Observations limited to 2,607 stores in fifteen cities

**Table III—Modernization Needs by Kind of Business**

**In per Cent of Each Group**

| Kind of Business | Outside Signs: Install or Replace | Outside Signs: Paint or Repair | Window Lighting, Replace or Improve | Lighting Fixtures New or Add'l | Departmental Neon Signs, Install.* | Ventilating Equip't Install. |
|---|---|---|---|---|---|---|
| 1,226 Grocery stores | 21.5 | 4.6 | 1.3 | 34.7 | 8.9 | 10.3 |
| 479 Other food stores | 18.4 | 2.7 | 2.7 | 22.1 | 4.1 | 9.2 |
| 298 General mdse | 16.8 | 3.4 | 4.7 | 33.9 | 13.8 | 13.1 |
| 694 Apparel stores | 22.0 | 3.7 | 2.7 | 21.2 | 7.2 | 11.1 |
| 944 Automotive group | 13.7 | 3.0 | 0.3 | 23.3 | 8.2 | 5.6 |
| 267 Furniture group | 20.5 | 6.7 | 3.7 | 29.5 | 13.4 | 8.2 |
| 460 Hardware and bldg | 22.2 | 4.8 | 2.2 | 27.2 | 9.1 | 9.8 |
| 1,128 Restaurants, etc | 12.9 | 4.6 | 1.0 | 26.9 | 6.4 | 13.7 |
| 85 Cigar stores | 9.4 | ... | 1.2 | 22.4 | .... | 11.8 |
| 420 Drug stores | 13.1 | 7.6 | 1.7 | 23.8 | 12.2 | 6.2 |
| 143 Jewelry stores | 15.3 | 4.9 | 3.5 | 27.1 | 8.8 | 12.5 |
| 112 Stationery and book | 22.3 | 0.9 | 4.5 | 26.8 | 10.0 | 8.9 |
| 327 Misc. retail | 19.7 | 4.6 | 3.7 | 40.6 | 10.2 | 9.8 |
| 579 Barber, beauty shops | 19.2 | 5.4 | 1.0 | 22.5 | 6.2 | 10.0 |
| 592 Cleaning, pressing | 15.4 | 5.6 | 1.5 | 33.8 | 4.9 | 11.8 |
| 324 Mechanical service | 22.6 | 4.2 | 2.0 | 32.5 | 9.5 | 10.7 |

* Observations in 2,607 stores in fifteen cities.

# Highway Lighting Moves to Higher Intensities

## Six-Year Evolution in Schenectady County Shows that High Lumen Intensities Are Needed for Heavy Traffic

By RALPH P. WAGNER

Commercial Manager New York Power & Light Corporation, Albany

SIX YEARS ago Schenectady County installed the first major highway lighting installation in New York State and probably the first major installation of this type in the country. Four thousand-lumen inside-frosted lamps were spaced 250 ft. apart and alternately located on each side of the road. Lighting units were mounted at a height of 23 to 24 ft. and suspended from 2 to 3 ft. inside the edge of the highway. The result was so satisfactory that the residents of Schenectady County and the Board of Supervisors made an extensive study of the effect of this lighting on highway traffic. The survey showed that day accidents increased 13.1 per cent and night accidents decreased 40 per cent. Road conditions during the period, except for lighting, were practically the same except that the total volume of traffic both night and day steadily increased. After the installation of this first lighting a short experimental strip of sodium units was installed.

When the benefits of the first lighting became apparent the county, in 1935, began to plan for more and better highway lighting, and as a result there is now under construction 24 miles of modern lighting in the county, 17 miles of which is of the new sodium type, while the rest is incandescent.

### *Intensity more than doubled*

It was recognized that 4,000-lumen lamps, spaced at 250 ft., would be inadequate to handle the amount of traffic which the main highways of Schenectady County were carrying. The majority of the Board of Supervisors felt that whatever lighting was installed should be adequate and proper and decided to install 10,000-sodium-vapor units, 250 ft. apart, on the Schenectady-Duanesburg road. The luminaires were located on one side of the road. On curves the lamps were placed on the outside of the curve and the spacing was shortened, depending on the sharpness of the curve, to approximately 200 ft.

On the Ballston Road, because of the residential character of the highway, it was decided to install incandescent luminaires of the Reid type, with 4,000-lumen lamps, located 125 ft. apart and suspended 25 ft. above the pavement and 5 ft. inside the edge of the roadway. In addition to these two strips of road, the portion of the Albany-Schenectady highway located in Schenectady County has been lighted with 10,000-lumen sodium units, spaced 125 ft. apart, staggered.

At the present time highway lighting on the other roads of Schenectady County provides 16 lumens per linear foot of highway, or a little more than a third of that which is now being

[*Continued on page* 93]

# Editorials

HOWARD EHRLICH . EDITOR

## *Practice Out of Synchronism With Preaching*

THE President has addressed a letter to engineering educators with a plea that prospective engineers be trained more fully in social and economic science. Somebody must have given him what, in popular parlance, is called a "bum steer," because that has been the major subject of discussion in and out of the Society for the Promotion of Engineering Education for a decade. Professors are known to have told their industrial and electrical students soon after the war that they would live to be accused of upsetting the economic applecart if they persisted in putting a motor on the rear and ball bearings on the axles. They would do well simultaneously to improve the economic highway, take out the blind corners and sinuous hazards and teach the operator to make smooth haste with serene safety.

Engineering education has set out to accomplish just that. Students are learning more of the social and economic consequences when a technologic pace outstrips the rate at which human relations can accommodate themselves to a changed industrial order. As graduates in professional practice, they are eager to apply that perception of responsibility in their daily plans and commitments. Collective mechanism is being perfected to effectuate these individual aspirations to enhance the social stability contributions of the technical professions.

But all this consciousness of social obligation suffers a setback in the face of political operations that flout the engineer's proverbial respect for facts and for economic justification of all his acts. Developing huge water power first, with no assurance of a later market for the power, is not what a conscientious engineer would do. Nor would he exaggerate beyond all reason the value to navigation so as to make the power aspects alluringly cheap in appearance. No honest engineer would argue that duplication of competitive facilities could do other than incur economic loss. Many more instances could be cited where the administration has gone counter to the very principles of social economy which the President urges the engineer to emulate.

## *Fair to Call Attention to Outage Causes*

RUNNING down the competitor is a temptation that confronts every salesman, but, fortunately, it is no mark of the great bulk of selling today. Drawing the fine line between selling one's own product and preventing the competitor from selling his is no simple task. Candidly, we believe the utility power salesman is, on the whole, most scrupulous in this respect.

But can he gracefully raise questions about the competitive service so that the intangible merits of his own product will become tangible by comparison with actualities? We think he can. We think it is quite proper to cite the records of continuity of utility service and to make available to querulous patrons or prospects just what the competitive service affords in this particular. It is justifiable for the power salesman to be critical of competitive power equipment for the benefit of his client.

Industrial users have their own measures of the values of interrupted production. They should know what an hour's loss or a day's loss means in sacrificed output and profit. If they can learn what others have experienced in this respect through unforeseen mishaps they are that much surer of their decision's being based on a long-range dollar result. Who ran out of fuel, whose grates collapsed, who lost a cylinder head or had a connecting rod break or a bearing fail, who could get no water in a drought season, who had labor trouble or lubrication trouble, who had a generator burn out while the reserve machine was being overhauled? Those are matters which a prospect should ask of the competitive power salesman, or, failing an answer, of a utility power salesman who, through his broad local contacts, may also know. If he is asked, may he not tell provided he is equally fair in admitting whatever outages he knows may have occurred in his own service?

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## *For a Broadened "Arkwright Plan"*

WITH a frequency somewhat unusual, perhaps, observers of the national utility picture are urging a wider acceptance of the "Arkwright plan" for the settlement of rural extension disputes.

The plan, reported August 29 in ELECTRICAL WORLD, is based upon a determination as to which rural areas Mr. Arkwright believes his company should serve and an offer by Mr. Arkwright to render complete assistance to rural residents of other areas in Georgia in securing electric service through some other agency. It includes also an offer to repair, maintain and assist in the operation of such lines, if desired by the rural customers.

The plan seems to have much to commend it. Certainly while department heads put in night work

at the office wrestling with their 1937 budgets, somebody in the company might well afford to take the time to shape up tentative limits to the company's rural territory.

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## *Hold the Gas and Sell the Electric?*

NOW comes news that the Los Angeles Gas & Electric Company has sold its electric business to the Bureau of Power and Light for $46,000,000. The bureau also has the equivalent of an option to buy the gas business in future years. This move to sell the electric business and retain the gas business is a policy adopted in other analogous situations. We doubt its wisdom. If a municipal electrical enterprise meets gas competition its first move will be to buy out this competitor and take over the gas business also. Once the wave starts for municipal operation of one competing utility it will sweep over the opposition.

It is the job of each utility management to decide to sell or to fight when approached by municipal authorities, but there should be no mistake about the ultimate acquirement of both the gas and electric business when a sale is decided upon and conditions are competitive. This Los Angeles sale is a final closure of an interesting and historic competitive electric situation in one of the major American cities. It gives the bureau free play and full control of the city that must use most of the Boulder power. We wonder if that fine steam plant of the private utility will now be shut down in favor of Boulder power. We doubt it, if costs are to be considered.

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## *"Electrical World" Strengthens Editorial Staff*

THIS post-depression period which gives evidence of a long upward swing has presented ELECTRICAL WORLD with a new opportunity to serve the electrical industry. In order to take full advantage of this opportunity, the editorial staff of ELECTRICAL WORLD has been greatly strengthened. In addition to a large headquarters staff, there are regional editors in New England, the Middle West, the Pacific Coast, and Washington, D. C., besides correspondents in nearly one hundred cities.

Howard Ehrlich, vice-president of the McGraw-Hill Publishing Company, has assumed the editorship.

S. B. Williams, for the past fourteen years editor of *Electrical Contracting* and its predecessor, *The Electragist,* on December 1 became managing editor. Mr. Williams has been engaged in editorial work on electrical papers since his graduation as electrical engineer from Princeton in 1914. For eight years he was on the staff of ELECTRICAL WORLD, resigning as assistant managing editor in 1922 to become managing editor and then editor of *Electrical Record.*

A. E. Knowlton, associate editor, has been a member of the staff for the past six years. His experience as electrical engineer for the Connecticut Public Utilities Commission, as associate professor of electrical engineering at Yale University, as a consulting engineer and as a member of various A.I.E.E. and industry committees, makes him eminently qualified to direct all of the engineering phases of the publication.

H. G. Dooley, who was assistant to the president, Florida Power & Light Company prior to joining the staff early in 1936 as associate editor, had been engaged in every phase of utility operation over a period of fourteen years. He will direct the editorial treatment of public utility management, commercial activity and public relations.

E. Dalton White was appointed news editor on December 1, coming to the paper from the New York *Herald Tribune,* where he had been public utility editor for 2½ years and prior to that had worked for a year and a half in the same capacity on the New York *Journal of Commerce.* His previous experience includes banking, public utility research and engineering.

G. F. Wittig, for the past 10½ years statistical editor, brings to his work a background of engineering practice and teaching. During the war he was division electrical engineer at Camp McClellen. He has taught electrical engineering at the Universities of Maine, Yale and Alabama.

D. T. Braymer, assistant editor, was formerly in the assembly and test departments of Howell Electric Motor Company and later in the operating department of the New York State Electric & Gas Company.

Charles DeVore joined the staff this summer upon completion of his studies in electrical engineering and journalism at Nebraska.

In adidtion to the above headquarters staff, ELECTRICAL WORLD is represented by the following experienced branch office editors:

H. S. Knowlton, New England editor, a writer on electrical subjects for many years, who received his practical experience with the Boston Elevated Railways and Stone & Webster.

F. R. Innes, Western editor, who previously had had considerable practical experience in substation operation with the Detroit United Railways, meter work with Detroit Edison Company, and illuminating and general engineering with the Sessions Engineering Company.

C. W. Leihy, Pacific Coast editor and also associate editor of *Electrical West.*

Paul Wooton, Washington editor, for many years a well-known Washington newspaper correspondent and one of the best-informed men in the national capital on political and government bureau activities.

# No Enthusiasm for Seaway

THE timid swimmer hates to dive. He would rather ease in, shivering again and again as each additional square inch of skin is chilled by the water. Yet he knows that a dive would get it all over with in one quick shock. It is a human failing to postpone the evil day—to drag out the torture. Sometimes there is hope, usually vain, that trouble postponed is trouble avoided, as in the case of the small boy who plays hookey from a dentist's appointment.

Looking backward, a great many business men now wish to heaven they had "dived" in 1929—taken it on the chin—gone through bankruptcy or receivership—cut their staffs to skeleton proportions at the first sign of hard times—and borrowed not at all. For the first time since President Hoover set up the Reconstruction Finance Corporation there have been heard, in the last few weeks, some open regrets that this move was ever made.

The most vociferous objectors—now that the depression is practically over and daylight is clear ahead—are railroad executives. But the only reason the utilities are less critical is that the utilities used this agency much less. Few lines of business endeavor actually held up better during the depression than did the operating utilities.

A barrage of such criticism of government loans and the resultant spending at a time when earnings did not justify it was loosed at a recent Washington dinner party, touched off by the director of a large railroad company.

"I WISH to heaven," he said, "that Herbert Hoover had let nature take its course instead of trying to stem the tide. My company borrowed millions to pay bond interest. It would have been much better if we had defaulted on the bonds and gone through a receivership.

"It would have been tough on the bondholders—at the time. But our railroad company would be much better off today in every possible way. We would not be owing the government huge sums now. We would have a much smaller total debt to private investors also, for that would have been scaled down equitably in the reorganization. So we could use the money we are now paying for dead horses for improvements and betterments."

"You weren't talking that way when your company was borrowing this money from R.F.C.," commented another guest, dryly. "You were thanking God for R.F.C. and figuring it was saving your hide."

"On the contrary," said the railroad director, "at one board meeting I strongly opposed borrowing the money to meet bond interest. At that time we were faced with the alternative of receivership because interest was past due on 4 per cent mortgage bonds. Those bonds were selling at that moment for 20. I told my fellow directors that I would cheerfully vote to borrow money if we could buy in the bonds at that figure, but not to pay the interest on them. It amounted, you see, to 20 per cent on the then price of the bonds. Borrowing to pay interest was just deferring the evil day."

"MY company," broke in the director of a big utility corporation, "had no trouble in meeting its coupons out of earnings. But the same sort of psychology, which I now think was very bad, urged us to err in the same direction. You all remember that President Hoover kept urging us all not to cut our forces—not to contribute to unemployment, but to keep every man possible on the payroll.

"So instead of cutting our staffs in 1930, as we should have done as soon as we realized that this was not just a money panic, but a real depression, we held on so long before applying the axe that we were really in rather bad shape by 1933. We have been cutting into our reserve until there isn't much reserve left. And now, under the present tax law, we cannot build that reserve back without paying a punitive tax on every dollar we put into it.

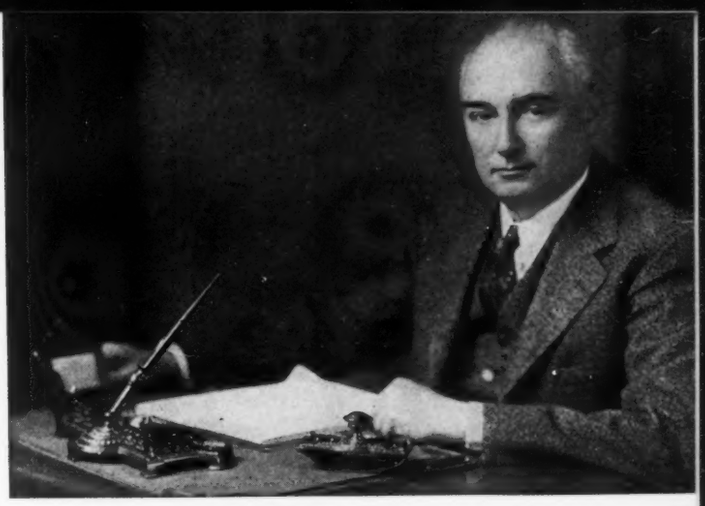
"I agree with you railroad fellows that we all ought to have taken it on the chin in 1930, permitted the depression to hit bottom speedily, and then probably we would have led the world out of the depression, as this country has done in every previous depression of world magnitude."

"You are both right," agreed the oldest man present. "I am sure I would not have agreed with that logic in 1930, or even in 1932. I have been retired for some years, and my income would have been hit a good deal harder than it was if your companies had not borrowed money to pay my coupons. But we didn't have anything like the R.F.C. in 1893, or in 1907, and we lived through it. In fact, we recovered a good deal more rapidly, in all past depressions, than we did this time."

"You are just a lot of hopeless Tories," said a strong Hoover advocate, who had been listening in amazement as he heard criticisms for the first time since it was set up of what perhaps has been the least criticized of all the alphabetical agencies. "I was for Hoover in 1932, but my heart was with Roosevelt this time, and now I know I was right.

"Talk about the horse-and-buggy days—you are living back in feudal times, mentally. Don't you realize if your big industrial units had followed the course you are now wishing they had that there would have been a revolution? In those olden days you are comparing this depression with the farms could take care of most of the industrial workers during hard times. Most of the industrial workers were either farm boys or immigrants. The farm boys could go back home. The immigrants formed the bread lines.

"But workers had a different mental attitude in those days. They would not have taken it lying down in 1930, I assure you. There would have been bloodshed aplenty. Hoover would have been thrown out of the White House. You smug Tories wouldn't have any corporations today at all. Somebody like John L. Lewis would be dictator."



## —By CARTER FIELD

*This noted journalist gives his personal comments and interpretations on current happenings affecting the electrical industry. His background and his location at Washington make his thoughts informative and interesting even though all may not agree with him.*

"You pay your money and take your choice," interposed the host, pacifically. "What do you say to just a spot more brandy and coffee before we join the ladies?"

DESPITE the tremendous prestige given to Franklin D. Roosevelt by the overwhelming character of his majority, and despite the enlarged Democratic majority in the Senate, it is by no means certain that the President will be able to get his pet St. Lawrence Seaway Treaty ratified, revise it to meet objections as he may. The vote by which that treaty was rejected two years ago was not along party lines. It was chiefly on geographical lines. Senators from the Atlantic and Gulf coast states voted against it almost as a unit. There have been many changes in the personnel since then. Two elections have occurred. But the reasons which caused this geographical group to be against the canal are just as strong today as they were then.

President Roosevelt's personal interest in the canal has always been because of the electric power angle. He has, of course, never referred slightingly to the seaway possibilities, for obvious political reasons. But it is the power phase which really intrigues him.

The real demand for the canal, however, came from the Middle and Northwestern states, and came purely because the people in that region believed it would build up the ports of the Great Lakes and reduce carrying charges on wheat and other crops from the Western farms to Liverpool.

Liverpool, because that city has been recognized as the premier wheat market of the world, where world prices for wheat are made. So that the wheat producer can expect to get for his wheat the Liverpool price, less freight and insurance to Liverpool.

At the time the demand for the St. Lawrence Seaway really became strong—in the states from Ohio to Montana—the U.S. was exporting enormous quantities of wheat. As the years passed the amount has dwindled. Now this country is importing more wheat than it exports.

It may be that this situation will change, that the U.S. again will become a great wheat exporting nation.

All of which does not pretend to say that the St. Lawrence Seaway may not even be more logical ten years hence than it was ten years ago. Especially if the present era of national restrictions on trade, what with quotas for imports, etc., should pass. But that is another story. The present fact is that a great many people who were enthusiastic about the St. Lawrence Seaway a few years ago find it rather academic now. Not the local boosters in the lake ports, of course, but the folks interested in cheap freight rates on grain.

But there has been no such mellowing of the interest of the Atlantic and Gulf ports in the project. They are just as excitedly against it as ever. Talk of a deal between the Florida Canal advocates with the St. Lawrence Seaway boosters, recently printed, caused the greatest excitement in New Orleans, a city which some might think would not worry much about any possible effects on its commerce of the St. Lawrence Seaway, and which also should figure on benefiting from the Florida Canal. On the contrary, the feeling there is so strong against the Northern waterway that friendly as Huey Long's successor in the Senate might feel to the President, he would not dare approve it.

The strange feature of the whole business is that fear of the effects of the St. Lawrence Seaway should extend so far south. But it will be remembered that both Georgia senators voted against it, and one senator from Texas! On top of which that seer among political prophets, Senator James Hamilton Lewis, just triumphantly re-elected, announces that of course he cannot vote for any treaty which gives Canada any measure of control of a purely American lake! He refers, of course, to Lake Michigan, and brings to mind the point that Chicago's ambition to be a seaport is not comparable with her concern about the drainage canal.

SENATOR LEWIS, who in more than twenty years, to this writer's knowledge, has never made a sour prediction, also forecasts now that there will be no constitutional amendment submitted to the states by Congress in the session to open next month. This is of intense importance in view of all the agitation for a revival of some form of NRA, the discussions at the George L. Berry conference, the insistence of John L. Lewis that the Guffey coal bill be pushed through, etc.

It is vital because there is very general agreement among lawyers that the regulation of wages and hours, as attempted under NRA, simply cannot be achieved by the federal government without a constitutional amendment. This is one of the moot cases, it is pointed out, where a mere "packing" of the Supreme Court would not suffice. Nor would any reasonable number of changes. The decision of the high court in the NIRA case was *unanimous*. Which means that Justices Brandeis and Cardoza, generally regarded as being as liberal as any one likely to be appointed to the court in the event of vacancies in the near future, voted that it was in conflict with the Constitution.

Senator Lewis takes the view that business itself is already doing what NRA was intended to do. Meanwhile, the President stands utterly uncommitted, with no pledges and no promises to embarrass him!

# News OF THE WEEK

## Life of George Westinghouse Commemorated by American Society of Mechanical Engineers

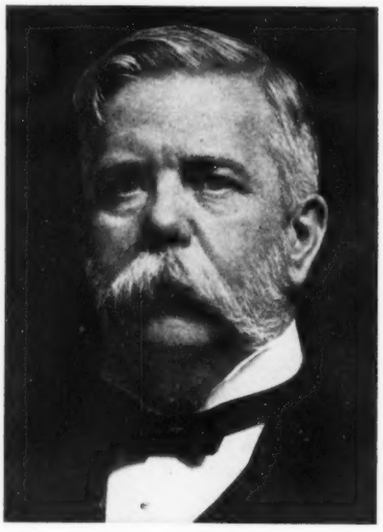
**Engineering Achievements of Pioneer in Five Fields Are Reviewed by Former Associates at Afternoon Forum — Anecdotes Give Glimpses of His Personality — Dr. Angell and Paul Cravath Pay Tribute in Evening Ceremony**

The year 1936 marks the 90th anniversary of the birth of George Westinghouse. In commemoration of this event the American Society of Mechanical Engineers paid tribute to Mr. Westinghouse at two special sessions, held December 1, in conjunction with its 57th annual meeting in New York City, November 30 to December 5.

Dr. James R. Angell, president of Yale University and Towne Lecturer for 1936, and Paul D. Cravath, longtime associate and legal adviser to Mr. Westinghouse, presented appreciations of the man as well as of his achievements, from a layman's point of view, at the evening meeting. The engineering aspects of his activities were recounted at the afternoon forum by a group of speakers—most of them former associates—who included in their discussions anecdotes revealing something of his personality and sterling character.

Dr. Angell, speaking on the subject "Achievements of Westinghouse as Factors in Our Modern Life," dwelt on his accomplishments and their effect on industrial development and characterized his life as a "vivid object lesson in the advantages of simple living, high aims and hard work."

Mr. Cravath presented the topic "Westinghouse, the Man" and said that this year is the 50th anniversary of the beginning of his association with Mr. Westinghouse. He pictured him as being "simple, unassuming, direct, frank, courageous, unfaltering in his faith and supremely confident



in the ultimate triumph of his plans" and declared: "comparing George Westinghouse with the other men of his generation who acquired conspicuous positions in the world of industry and finance, it is my sober judgment that no man I have known combined so many of the qualities that make for greatness."

Mr. Westinghouse's pioneering work in alternating current, the steam turbine, railway electrification, the air brake, and a less technical field, industrial organization, engaged the attention of the afternoon forum, which was arranged and presided over by Dr. C. F. Scott of Yale University.

A. W. Berresford, past-president of the A.S.M.E.; L. B. Stillwell, consulting engineer (retired), and C. R. Beardsley, superintendent of distribution Brooklyn Edison Company, told of Mr. Westinghouse's interest in alternating current and gave particular attention to his part in the development of the modern transformer.

E. E. Keller, formerly vice-president Westinghouse Machine Company, and Francis Hodgkinson, consulting engineer (retired) Westinghouse Electric & Manufacturing Company, reviewed his work with the steam turbine; Frank W. Smith, president Consolidated Edison Company, pointed out the great value of the steam turbine in the power stations of New York.

Mr. Westinghouse's activities in railway electrification were presented by N. W. Storer, consulting engineer (retired), Westinghouse Electric & Manufacturing Company; Samuel Vauclain, chairman of the board, Baldwin Locomotive Company; George Gibbs, of Gibbs & Hill, consulting engineers; W. S. Murray, consulting engineer, formerly with the New Haven Railroad; and J. V. B. Duer, chief electrical engineer Pennsylvania Railroad. Previously, Ralph Budd, president Burlington Lines, and W. W. Nichols, assistant to the chairman, Allis-Chalmers Manufacturing Company, recounted Mr. Westinghouse's development of the air brake bearing his name.

Thomas Campbell, oldest employee of the Westinghouse Air Brake Company, told of his early associations with Mr. Westinghouse. He recalled

the time that Mr. Westinghouse chartered an entire train to take his employees to the Philadelphia Centennial in 1876. As an additional means of reviving the memory of Mr. Westinghouse as a genial employer he played several tunes on a flute, tunes which had been favorites of Mr. Westinghouse and which Mr. Campbell had often played for him.

Finally John F. Miller, vice-chairman Westinghouse Air Brake Company, told of the industrial organization of Mr. Westinghouse, recalling his friendly relations with his employees, and depicted him as having the "conception of an employer as the head of a family of workmen, responsible in a way for their welfare."

*Extracts from Tributes by Speakers*

Extracts from the tributes paid by speakers at the function follow:

We are gathered to celebrate the 90th anniversary of George Westinghouse by recounting his career and achievements.

Westinghouse exemplifies the "rugged individualism" of the pioneers who built the America we inherit. He did not invade the wilds of the West, but was a pioneer on the new social frontier where applied science and engineering and industry bend the forces of Nature to the practical welfare of the people.

Transportation and power—two great agencies in the industrial, economic and social changes of recent times—were his chosen fields.

Not merely an inventor or technical expert, he was an engineer in the broadest sense. To make Nature's elements of use to mankind involves the recognition of a need or an opportunity, the invention of some new method or device, the development of the idea into concrete and practical form, then preparing for its production, convincing others of its usefulness and supplying it for service. All these things Westinghouse did. He had facility in dealing with men and organizing them for research and development and manufacturing as well as facility in dealing with physical things—a rare combination.

**W. L. BATT,**
President of the A.S.M.E.

Practically all of the changes which during the last century have determined the external complexion of civilization and much of its internal quality rest on just such ingenious and carefully matured devices as George Westinghouse gave his life perfecting, and the great enterprises of industry and commerce and transportation constantly testify to the profound effect it has all had upon the daily experience of millions of people. Moreover, there can be no question that through these agencies the world has been brought into a more close-knit relationship of mutual dependence and that in many respects the life of the average person has been made safer, easier and more enjoyable. . . .

All this line of consideration reduces to the familiar ethical truism that no fact taken of and by itself is necessarily either good or evil, but inevitably depends upon the purpose to which it is put and the results which emanate from its use. In this sense, I think it must be admitted that the great task of our day and generation lies more in the field of morals and even religion, if you will, than in the field of engineering and economics narrowly conceived. As I read the life of George Westinghouse, I carry away the conviction that he would himself be increasingly disposed to take this view had his life rounded out the century. Certainly his own career is a vivid object lesson in the advantages of simple living, high aims and hard work, and it is impossible to believe that he would have felt anything but regret could it be shown that the industrial age to which he gave such brilliant leadership throughout his life was contributing to soften the fiber of the race, or to introduce into it elements of moral disintegration. Most of us believe that this is quite untrue and that the great engineering victories of men like Westinghouse constitute a blazing challenge to us to build a social order able to incorporate in itself all these blessings, while safeguarding the finest values that inhere in the human spirit.

**DR. JAMES R. ANGELL**

I have reached that unfortunate age when frequently recurring semi-centennials are a constant reminder that I have been on the stage of life beyond the allotted span of three-score years and ten. This year happens to be the fiftieth anniversary of the beginning of my association with George Westinghouse. He was my first important client, and my association with him until a short time before his death was very close and intimate. I confess on this occasion, when most of you who had no close personal contact with Mr. Westinghouse are thinking of the inventor, it is the man and not the inventor, that dominates my memories of my long association with him, so that the topic you have assigned to me fits in with my mood . . .

*Portrait of a man*

In my humble role, I worked at his side in the development of his electrical enterprises which, after the successful establishment of the Air Brake Company, absorbed the major part of his energy and interest. I saw him thus intimately under almost every conceivable condition—in his home, at his office, in his factory, in his private car, which was almost another home, abroad as well as in this country. I saw him when he was elated by successful achievement, and amid disappointments and discouragements, and more than once in the face of threatening disaster. I saw him when he was carrying a load of responsibility under which any other man whom I have ever known would have fallen. He was always the same; simple, unassuming, direct, frank, courageous, unfaltering in his faith and supremely confident in the ultimate triumph of his plans. I have seen him wearied almost beyond endurance; disappointed beyond expression over some miscarriage of his plans; wounded in his feelings because he had discovered stupidity where he expected intelligence, discouragement where he had expected encouragement, disloyalty where he had a right to expect loyalty. I have seen him more than once when every man about him despaired of his being able to attain the ends for which he was striving and advised surrender or compromise, but I have never known him to acknowledge defeat nor to yield to discouragement, nor to falter in his efforts to accomplish his main objectives.

Comparing George Westinghouse with the other men of his generation who acquired conspicuous positions in the world of industry and finance, it is my sober judgment that no man I have known combined so many of the qualities that make for greatness. The qualities that constitute genius in a human being defy definition. Judged by the standards that I am able to apply, George Westinghouse was a great genius.

**PAUL D. CRAVATH**

# Steamotive Power Plant Units Shown at A.S.M.E. Convention

**Self-contained system offers advantages for use in small territories — Union Pacific to use units in locomotives**

Challenge is offered to Diesel-electric power units in the announcement at the A.S.M.E. annual meeting in New York this week of a new "Steamotive" unit in the 2,000-10,000-hp. range. It is a joint development of the General Electric, Babcock & Wilcox and Bailey Meter companies. Two installations are working, one in the Lynn G.E. plant and the second in another industrial plant. The Union Pacific is having two oil-fired Steamotive units built, each with a capacity of 40,000 lb. per hour, to power two 2,500-hp. locomotives.

That these self-contained power plants are compact is seen from the fact that the Lynn unit of 21,000 lb. per hour was shipped complete on a flat car. It is vertically a packaged power plant. The Lynn feed pump delivers 25,000 lb. of water per hour at 2,000 lb. and the blower 30,000 lb. of air at 60 in. water pressure.

High steam pressure (1,500 lb.) and temperature (950 deg. F.) make for minimum size and weight per unit of output. Quick response to load changes is a feature, the plant being capable of full load within ten minutes from initiating the combustion. The set is adaptable to a wide range of fuels and has completely coordinated auxiliaries and control. The auxiliaries which supply fuel, air and feedwater are actuated by the steam demand; automatic ignition and safety equipment are included.

Flame and gases pass through the completely water-cooled furnace into the superheater, thence around separator and into economizer and air heater and up the stack. Feedwater from the economizer outlet heater is subdivided into circuits constituting the floor, sides and roof of the furnace as well as the loops forming the boiler screen. The furnace and boiler setting have no refractory, being replaced by waterwalls and insulating block. Water content in the forced circulation boiler is small.

The reduction in weight and space are admittedly attained through reduction of plant efficiency at high loads and with considerable increase in auxiliary power. Where space is not at a premium, it will still be generally economical to use larger units with higher boiler efficiency and less absorption of auxiliary power.

### Port Washington behaves well

Within ten and one-half months after initial operation, the new 1300-lb., 80,000 kw. unit in the Port Washington station of the Milwaukee Electric Railway and Light Company had ground out 312,047,000 kilowatt hours. The fire was started on September 19, 1935, but minor troubles with governor, trip pin, rear-wall reheater insulation, unstable combustion, reheat temperature control, front-wall, air-port area, etc., delayed continuous operation until November 21, 1935, when a four-months continuous operating period began. Between then and March 14, 1936, (scheduled inspection) and since loads up to 82,000 kw. have been carried without difficulty. Average performance has been at 11,220 Btu. per net kw.hr. or 30.5 per cent overall thermal efficiency. The ultimate economy level appears to be 10,900.

Thirty-hour week-end shutdowns have demonstrated that the unit will be practicable throughout its lifetime. When later relegated to peak-load operation and daily outages, it will operate as satisfactorily as a non-reheat machine. The heavy high-pressure cylinder and not the reheat section determines operating limitations. F. L. Dornbrook, in his paper, concludes that the unit is reliable, easily operated and economical, operating costs to date having been about two-thirds that of the predecessor Lakeside station.

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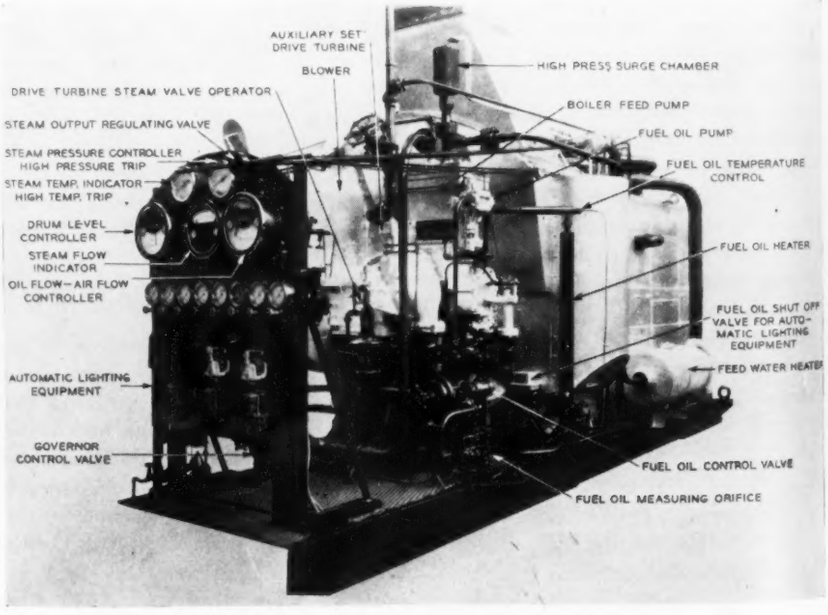
## "10 for 1" Plan Extended

G. W. Van Derzee, vice-president and general manager of the Milwaukee Electric Railway & Light Company, has announced the extension of the utility's "10 for 1" plan into January, 1938, with the approval of the public service commission. The promotional plan was to have expired in December. Its popularity is indicated by the fact that during November more than 100,000 users took advantage of it, according to Mr. Van Derzee. Customers of the company saved more than $663,000 as a result of it, it was declared.

Introduced in October, 1935, the plan enables residents, rural and commercial lighting customers to double their last year's use of electricty for only 10 per cent increase in cost.


AUXILIARY SET DRIVE TURBINE
BLOWER
HIGH PRESS SURGE CHAMBER
DRIVE TURBINE STEAM VALVE OPERATOR
BOILER FEED PUMP
STEAM OUTPUT REGULATING VALVE
FUEL OIL PUMP
STEAM PRESSURE CONTROLLER HIGH PRESSURE TRIP
FUEL OIL TEMPERATURE CONTROL
STEAM TEMP. INDICATOR HIGH TEMP. TRIP
DRUM LEVEL CONTROLLER
FUEL OIL HEATER
STEAM FLOW INDICATOR
OIL FLOW—AIR FLOW CONTROLLER
FUEL OIL SHUT OFF VALVE FOR AUTOMATIC LIGHTING EQUIPMENT
FEED WATER HEATER
AUTOMATIC LIGHTING EQUIPMENT
GOVERNOR CONTROL VALVE
FUEL OIL CONTROL VALVE
FUEL OIL MEASURING ORIFICE

**Development form of Steamotive unit co-operatively created by General Electric, Babcock & Wilcox and Bailey Meter companies**

# Utility Load Builders Gather at Nela Park's Tenth Conference

**Kitchen modernization, water heating promotion, advertising and sales discussed by prominent men in industry—New products pre-viewed**

*Special to* ELECTRICAL WORLD

"Strike while the iron's hot" was the dominant note sounded this week by manufacturing executives and utility load builders at General Electric Institute, Cleveland, Ohio. Three hundred electrical merchandising experts taxed the institute's facilities during their two-day discussions of today's best utility selling technique against the background of General Electric's pre-view of 1937 products.

H. H. Bosworth, chairman, opened the conference, and kitchen modernization, water heating, merchandising sales and advertising were authoritatively discussed by George Whitwell, Kinsey Robertson, W. H. Hodge, T. K. Quinn, V. H. Moon, Austin Monty, O. M. Jackson and G. W. Allison.

Kinsey M. Robinson, president and general manager Idaho Power Company, described his carrier-current control of water heating load (ELECTRICAL WORLD, November 28, 1936, page 7) and O. M. Jackson, Georgia Power Company, "reported" to the conference results of his Champion Home Town Contest (ELECTRICAL WORLD, November 21, 1936, page 58).

Greatest stress was laid upon the increased purchasing power of utility customers and the opportunity presented for new selling records. "The electrical industry offers one of the greatest opportunities, if not the greatest, for the American man today," Vice-President D. W. Appleton declared as he opened the assembly.

### *Revises kitchen plan*

G. E. Whitwell, chairman National Kitchen Modernizing Bureau, said he might clear up some misunderstandings by revising the order in which markets are listed. First, said Mr. Whitwell, he would mention modern kitchens for houses about to be built; second, houses now built and requiring one or more major appliances, and, third "those rare opportunities for the sale of the modern kitchen in one package."

Combination companies (gas and electric operations) should determine from a study of their local respective situations, he said, the manner in which they can best utilize the national program as a selling tool. Maximum benefits will accrue to a company, said Mr. Whitwell, when it ties in with the industry program and thus taps the advantages which result from co-ordinated effort toward the common goal of domestic market load building.

Kinsey M. Robertson presented an executive approach to a management problem which was solved by load building. Concerned over the problem of increased taxes, increased wages, forced rate reductions and diminishing returns, Mr. Robinson said he used added water heating business to secure earnings, and since May 1, 1935, 75 per cent of the added gross from water heating has been carried over into net.

Sales effort is what sells water heaters, Mr. Robinson averred, not advertising a one-cent or some other kilowatt-hour rate. The water heating business has, in general, been sadly neglected by utilities, is Mr. Robinson's view, and he added that all sales records of the industry would be broken if only utility executives, utility employees and employers of electrical manufacturers would buy and use appliances.

Highly complimentary were comments of institute guests regarding the fast-moving, concisely presented program, the products, prices and terms and the opportunity presented by the company for more than 300 men to get together for a practical discussion of current load-building practices.

**AT CLEVELAND THIS WEEK—Utility company merchandising executives gathered at General Electric Institute. G.E's vice-president C. W. Appleton appears at lower right**

# Four-Million-Dollar Hydro Plant Announced by Arkansas Power

**New plant to develop 31,700 Hp., President Couch says — Preliminary work to continue all winter — Tied in with other plants**

*Special to* ELECTRICAL WORLD

Harvey C. Couch, president Arkansas Power & Light Company, has announced beginning construction of the third large hydro-electric project of his company on the Ouachita River at Blakeley, 15 miles northwest of Hot Springs, Ark., and 25 miles above Carpenter Dam and power site.

Preliminary work will continue all winter and the new plant, according to present plans, will represent an additional investment by the company of approximately $4,000,000, Mr. Couch said. The Blakeley plant, Mr. Couch continued, is expected to develop 31,700 hp. and eventally to tie in with two other hydro-electric plants on Ouachita River—Carpenter and Remmel.

The work to be done now and through the winter consists largely of clearing away timber along the dam site, grading, building of railroad spur and such work. Mr. Couch said:

"We have started construction on our third hydro-electric plant on Ouachita River in conformance with provisions of license granted the company by the Federal Power Commission. We can clear the right-of-way, do grading for railroad spur which will haul material, clear the dam site and do other necessary work this winter. Construction will be in charge of C. S. Lynch, chief engineer for Arkansas Power & Light Company, who had charge of the construction of Carpenter Dam."

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## Chicago Utilities Vote Extra, Bonuses

Commonwealth Edison Company and the Public Service Company of Northern Illinois declared last week special dividends of $1 each on their common stocks, voted a bonus of 2½ per cent on annual earnings of employees and a wage of 2½ per cent.

James Simpson, chairman of the companies, issued the following statement:

"In the nine months of the year preceding the recent reduction in its rates by the Illinois Commerce Commission, Commonwealth Edison Company had accumulated a surplus over dividends which would be subject to the higher rates of the new federal surplus tax. Directors of the company therefore declared a special dividend of $1 per share, payable December 17 to stockholders of record December 3.

"The directors also authorized payment on December 15 of a bonus to all employees, except principal executives, equal to 2½ per cent of their pay in the twelve months preceding September 30, 1936, and authorized the announcement of a 2½ per cent increase in wages of employees effective January 1, 1937.

"Directors of Public Service Company of Northern Illinois declared a special dividend of $1 per share payable December 17 to stockholders of record December 3. They further authorized payment of a bonus of 2½ per cent of the past twelve months' wages to employees and a wage increase of 2½ per cent effective January 1, 1937."

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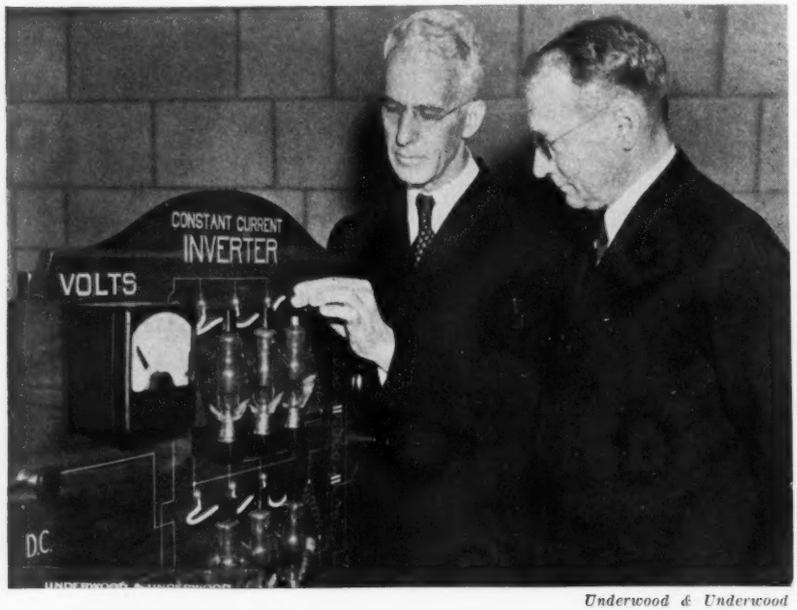
## Patent Centennial Observed by Leaders

The nation's leaders in applied science, art and industry gathered in Washington, D. C., on November 23 for the centennial celebration of the American Patent System. Chemists, physicists, aeronautical engineers and designers, television inventors, government officials, radio experts, biologists, metallurgists and business executives were among the group which gathered for the day's program of scientific reports and reviews.

A hundred years in the progress of lighting was summarized at the "Patented" dinner which concluded the celebration. Total electrical power used to run the display at its peak brilliance was 60,000 watts. This power was estimated by the electrical engineers of the General Electric Company contributing the display to be sufficient for the rest of the Mayflower Hotel where the banquet was held. The story of illumination from candles to the newest electrical lamps was shown in a dramatic sequence.




*Underwood & Underwood*

**NEW HIGH-VOLTAGE SYSTEM SHOWN—Dr. Albert W. Hull (left) of the General Electric Company explains a new type high-voltage direct-current system, such as is used in radio transmitter circuits, to Dr. V. K. Zworykin of the Radio Corporation of America at the parade of research given last week at the National Academy of Science in Washington as a part of the centennial celebration of the American Patent system**

## Air Conditioning Is 25 Years Old

December 8, 1936, will mark the 25th anniversary of air conditioning as an industry. While installations were in operation ten years before, first official recognition of air conditioning came in 1911. On December 8 of that year Willis H. Carrier, who is chairman of the board, Carrier Corporation, and regarded by many as the father of the air conditioning industry, presented two papers on the theoretical and practical aspects of that subject before the American Society of Mechanical Engineers.

In the following years the industry grew, with respect both to new developments and to increased acceptance by the public. In an address delivered early this year before a joint session of the American Society of Heating and Ventilating Engineers and the American Society of Refrigerating Engineers Mr. Carrier outlined the eight most important improvements in the industry, many of which he developed.

In a later address Mr. Carrier pointed out the cost of industrial installations and declared: "In industrial installations it is found that air-conditioning equipment will pay for itself in from a few months to four or five years. The average installation will pay for itself every two years in increased profits. Air conditioning for an office building costs from 19 to 30 cents per square foot to own and operate." And in an even more recent interview he stated: "A conservative calculation reveals that air conditioning in manufacturing processes is saving each American family budget an average of one dollar this year, and the future will return even more, to both the public and industry."

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### Seek Reduction in Rates

The New Jersey Public Utilities Commission, seeking further reductions in utility rates in the state, has begun a series of conferences with officials of the utility companies. The companies are preparing estimates of 1937 revenues and operating costs upon which the commission expects to achieve cuts of from $3,000,000 to $5,000,000 in rates.

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### New York Relief Tax Held Valid By Court

Right of New York City to impose a 3 per cent special emergency tax on public service corporations to raise revenue for unemployment relief was strengthened this week when the United States Circuit Court of Appeals ruled the law constitutional.

The test suit, brought by the Southern Boulevard Railroad Company, which operates a short surface car line in the Bronx, sought recovery of taxes paid on its gross revenue.

*Underwood & Underwood*

**WINTER WONDERLAND—Work continues at night at the scene of Grand Coulee Dam. In the foreground, the west abutment; in the distance, the temporary city for the contractors' forces**

## Increase Farm Lines 151% in 8 Years

Some facts and figures given in an account of the rural electrification activities of the Virginia Electric & Power Company may interest others concerned with this work. The company's system serves 25 counties in Virginia and sixteen counties in North Carolina. Part of its lengthened strides in rural electrification in 1936 may be due to its new shoes—a policy known as the Form "B" Plan.

This plan means, briefly, that the rural and farm customers served by the company guarantee a monthly amount equal to 1½ per cent of the cost of rural line construction. Lowering the average construction cost to $1,000 per mile — and in a few individual cases $800 per mile — has reduced this guarantee this year to something like $15 per mile and has also made it possible for the company to extend its lines into some areas where the customer density runs as low as four to the mile. (Previous to 1936 the monthly guarantee was 2½ per cent, which, with construction costs of between $1,200 and $1,500, varied between $30 and $37.50 per month per mile.)

Here, then, are the facts and figures, as reprinted from the November, 1936, issue of the *Vepcovian*, company's house organ:

**Table I—Rural and Farm Customers Served as of December 31**

| Year | Farm | Rural | Total |
|---|---|---|---|
| 1929 | 1055 | 6,700 | 7,755 |
| 1930 | 1589 | 8,960 | 10,549 |
| 1931 | 1949 | 10,000 | 11,949 |
| 1932 | 1950 | 10,400 | 12,350 |
| 1933 | 2058 | 11,000 | 13,058 |
| 1934 | 2099 | 11,300 | 13,399 |
| 1935 | 2122 | 11,800 | 13,922 |
| 1936 (est.) | 2600 | 13,700 | 16,300 |

**Table II—Farm Consumption**

| Year | Kw.-Hr. | Average Cost Cents per Kw.-Hr. | Average Annual Kw.-Hr. per Customer |
|---|---|---|---|
| 1929 | 992,190 | 6.61 | 993 |
| 1930 | 1,424,776 | 5.64 | 1,016 |
| 1931 | 2,648,883 | 4.36 | 1,479 |
| 1932 | 3,422,051 | 4.06 | 1,757 |
| 1933 | 3,583,196 | 3.92 | 1,829 |
| 1934 | 4,274,781 | 3.45 | 2,034 |
| 1935 | 4,818,050 | 3.06 | 2,268 |
| 1936 (est.) | 5,500,000 | 2.90 | 2,320 |

**Table III—Rural Line Construction**

| Year | Miles Built | Total Dec. 31 | Investment |
|---|---|---|---|
| 1929 | 161 | 881 | $1,322,500 |
| 1930 | 432 | 1,313 | 1,970,500 |
| 1931 | 223 | 1,536 | 2,304,000 |
| 1932 | 89 | 1,625 | 2,437,500 |
| 1933 | 51 | 1,676 | 2,514,000 |
| 1934 | 51 | 1,727 | 2,579,000 |
| 1935 | 88 | 1,815 | 2,684,000 |
| 1936 (est.) | 400 | 2,215 | 3,134,000 |

The company anticipates some 600 added miles of construction in 1937 and 1938, some 3,000 more rural customers.

## Power Association Revamps Organization

Organization of the three sections of the Northwest Electric Light and Power Association was completed recently after meetings of the section executive committees. All three sections, the business development section, the engineering and operation section and the accounting and business practice section, plan to hold their annual section meetings in the spring of 1937.

Structure of the business development section headed by George Wisting, Northwestern Electric Company, was changed by the formation of a committee on home service and one on home modernization, to be under the direction of the Residential Sales Bureau. The Commercial and Industrial Sales Bureau structure was likewise simplified, being divided into two committees, the general power committee and the commercial and industrial lighting committee. The Rural Sales Bureau will carry no subcommittees.

Organization of the engineering and operation section, under J. Hellenthal, is to include committees on production, transmission and distribution, utilization, accident prevention and power systems engineering.

Accounting and business practice section has set up no committee organization. C. E. Gieseker, Washington Water & Power Company was chosen section vice-chairman.

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## Conference Promotes Cooking Load

A conference of the field men of the Northwest utility companies engaged in promoting the commercial cooking load in their territories was sponsored by the Northwest Electric Light and Power Association last week, in Seattle, Wash. This was the second annual conference of this kind and was attended by 27 representatives of twelve companies. A. K. Gaylord, Portland General Electric Company, chairman of the commercial and industrial sales bureau of the association, was chairman, while local arrangements were in charge of C. T. Bakeman, Puget Sound Power & Light Company.

A complete review of last year's program and results, led by O. C. Mayer, Idaho Power Company, brought out the efficacy of various sales and promotion plans put into effect by the different companies in the territory. The use of an especially equipped truck for showing equipment at the door of the prospect's place of business was found particularly effective in small towns and rural areas.

C. L. Jacklett, Pacific Power & Light Company, called attention to the load-building value and to some of the operating conditions of refrigerator-locker systems for storage of meats and vegetables in refrigerated lockers.

Developments in kitchen ventilation were described by J. E. Yates, Pacific Power & Light Company, while A. K. Gaylord told of an experiment in air heating to be conducted in Portland.

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## Municipal Issues Customer Dividend

Again, by a vote of the Board of Electrical Commissioners, the Borough Electric Works of Wallingford, Conn., has declared a customer dividend. A 50 per cent discount was allowed on the latest month's bill provided payment in full was made within fifteen days.

This special customer dividend discount applies to all classes of service, residential, commercial and power. No discount was to be allowed unless the full amount was paid, in cases where customers were in arrears, and no discount was allowed on payment made after expiration of the discount date.

## *Meetings*

**American Engineering Council**—Annual meeting, Mayflower Hotel, Washington, D. C., January 14-16. Frederick M. Feiker, executive secretary, 744 Jackson Place, Washington, D. C.

**American Institute of Electrical Engineers**—Winter convention, New York, N. Y., January 25-29. H. H. Henline, national secretary, 33 West 39th Street, New York, N. Y.

**National Electrical Manufacturers Association**—Midwinter meeting, Waldorf-Astoria Hotel, New York, February 14-18. W. J. Donald, managing director, 155 East 44th Street, New York.

## Rural Conference Held at Purdue

Recent developments in uses of electricity on the farm and methods of building the farm load occupied the attention of ninety people who attended the eighth rural electric conference at Purdue University last week. Attendance was drawn from seven states and included utility rural service men, officials of newly organized farm co-operatives and representatives of the Rural Electrification Administration, farm press and manufacturing companies.

The conference was opened by H. J. Reed, assistant director of the Purdue agricultural experiment station, who stressed the fact that the part of the university in the rural electrification program was education and research to develop new uses for electricity on the farm.

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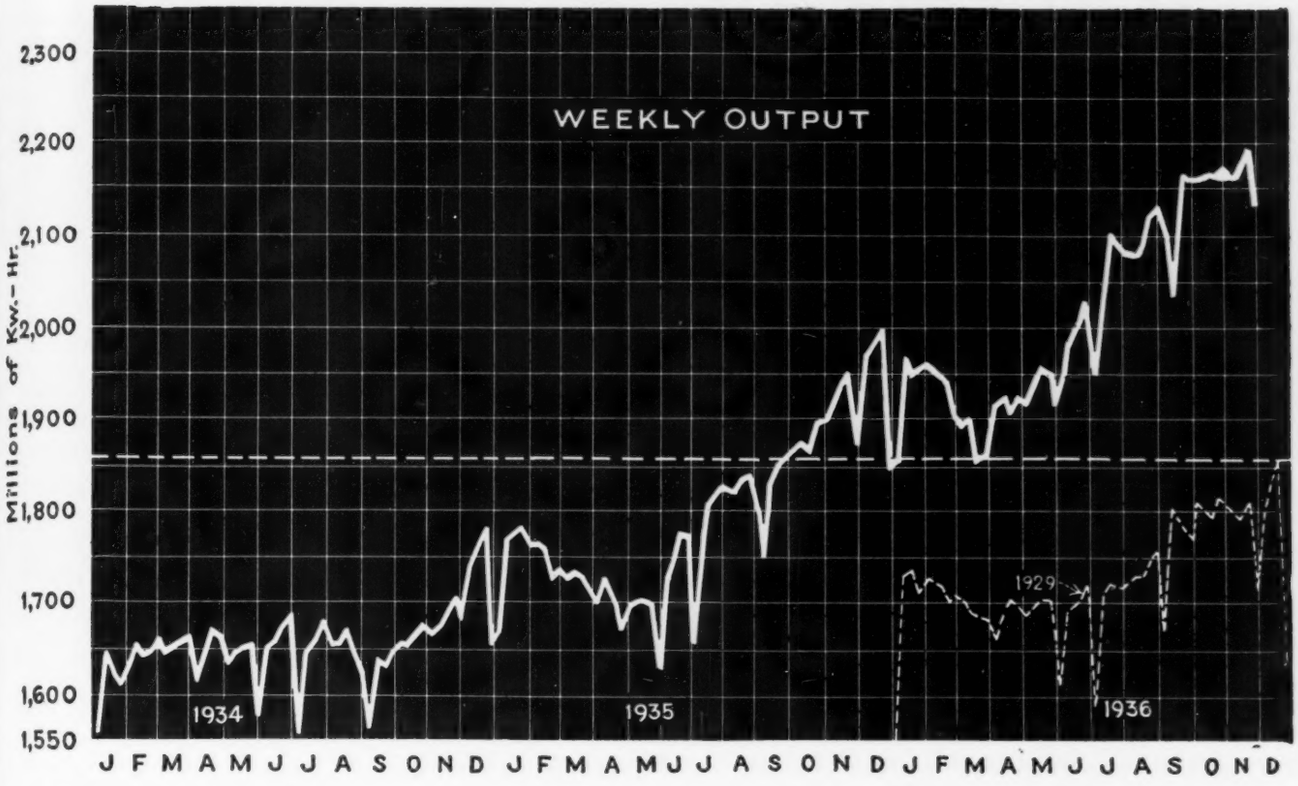
## Appliance "Bargain" Drive by N. Y. Edison

In an attempt to increase the consumption of electricity by its minimum-use customers—some 350,000 in number—the New York Edison Company has announced an "Electric Necessity Bargain Package Campaign" began December 1 to continue for an indefinite period.

The appliances to be promoted in this campaign have been divided into two groups and are to be offered at approximately half the regular list price, a test made possible through the co-operation of the manufacturers. Package No. 1 will contain a Westinghouse toaster, a G.E. Hotpoint iron and a Griest I.E.S. floor lamp with 100-watt bulb. It will be priced at $8.82, plus the city sales tax. Package No. 2 will include an Emerson a.c-d.c. table model radio in addition to these appliances and be priced at $17.64, plus the city sales tax.

Customers of the company will be able to purchase these appliances on a partial-payment basis without any financing charge; non-customers will be required to pay cash. Profits from the distribution of the bargain groups will go to the electrical dealers co-operating in the campaign and to employees of the Edison system companies.

# Week's Output 24 per Cent Above 1929




Thanksgiving Day brought the usual dip in the weekly energy output of central stations, but it was less pronounced than last year. Production during the week ended November 28 was 2,133,511,000 kw.-hr., according to the Edison Electric Institute, and thus showed a gain of 13.7 per cent over the corresponding period of 1935. The recession, due to the holiday, compared with the preceding week was about 63,000,000 kw.-hr., whereas a year ago it was 76,000,000 kw.-hr. The gain over the like week of 1929 was the largest on record, rising to 24.2 per cent.

The advance over 1935 has been noticeably larger during the second half of the current year than it was during the first half. Until the end of March it ranged around 10 per cent. In September it averaged above 16 per cent. Lately it has been between 12 and 14 per cent.

**Weekly Output, Millions of Kw.-Hr.**

| 1936 | 1935 | 1934 |
|---|---|---|
| Nov 28..2,134 | Nov. 30..1,877 | Dec. 1..1,684 |
| Nov. 21..2,196 | Nov. 23..1,953 | Nov. 24..1,705 |
| Nov. 14..2,170 | Nov. 16..1,939 | Nov. 17..1,691 |
| Nov. 7..2,169 | Nov. 9..1,914 | Nov. 10..1,676 |
| Oct. 31..2,176 | Nov. 2..1,897 | Nov. 3..1,669 |
| Oct. 24..2,167 | Oct. 26..1,896 | Oct. 27..1,677 |
| Oct. 17..2,170 | Oct. 19..1,863 | Oct. 20..1,668 |

**Per Cent Change from Previous Year**

| Region | Week ended Nov. 28 | Nov. 21 | Nov. 14 |
|---|---|---|---|
| New England | +11.1 | +10.0 | + 8.3 |
| Middle Atlantic | +13.3 | +12.8 | +11.6 |
| Central Industrial | +16.3 | +14.6 | +13.8 |
| West Central | + 8.0 | + 7.6 | + 8.3 |
| Southern States | +18.1 | +14.3 | +18.0 |
| Rocky Mountain | +10.8 | +12.3 | +16.0 |
| Pacific | + 9.2 | + 8.4 | + 6.5 |
| United States | +13.7 | +12.4 | +11.9 |

## Los Angeles Objects to E.H.F.A. Plan

The city of Pasadena, Calif., will not enter into an agreement with the federal government to collect monthly payments for electrical equipment sold on the installment plan, according to the announcement of C. W. Koiner, city manager. Pasadena operates its own municipal light and power department.

The city's objection to the plan (the E.H.F.A. is that it singles out one line of merchandise for the city to become interested in the sales promotion. Also, the city manager said, the city does not wish to encourage citizens to purchase new equipment which they cannot afford to buy already offered by local merchants. A further objection cited is that the contract might implicate the city in the business of repossessing electrical equipment on which payments have not been made.

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## TVA Workers Ask Wage Raise

The 11,000 workers of the T.V.A. have asked for a wage increase ranging from 15 to 25 per cent. Gordon Clapp, personnel director, after a two-day conference with employee representatives, said the board of directors would act on the request within about two weeks.

## 19-Companies Hearing Set

Arguments by nineteen power companies seeking an injunction against operation of the T.V.A. will be heard before Federal Judge John J. Gore in Nashville, Tenn., December 11. The date was agreed on by counsel. It had originally been set for December 1.

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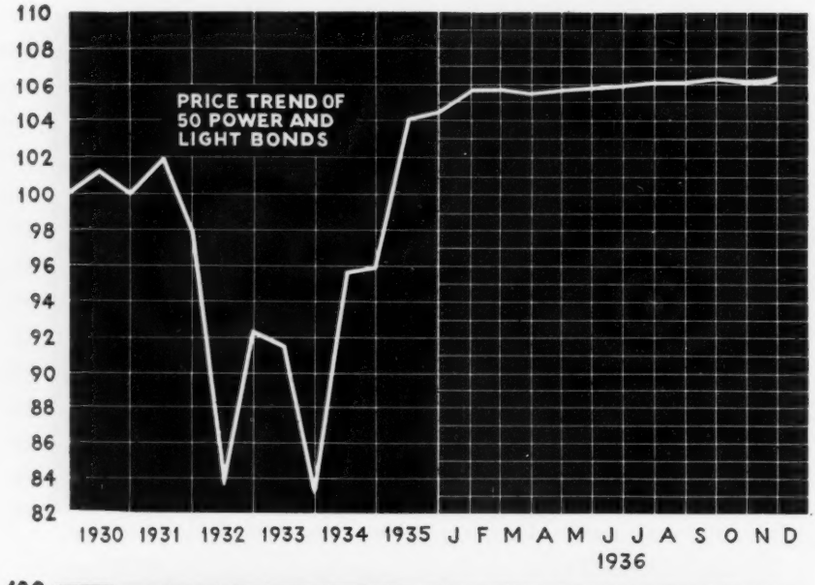
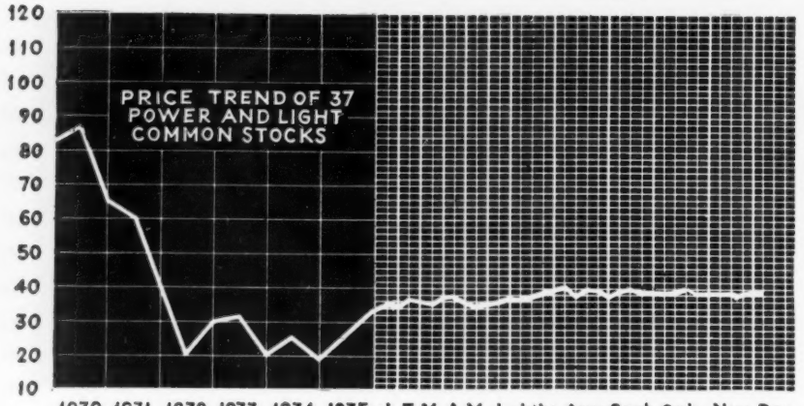
## E.H.F.A. Contracts

Electric Home & Farm Authority has announced that a contract had been closed with the Duck River Electric Membership Corporation, Shelbyville, Tenn.

Contract has also been closed with the city of Crawfordsville, Ind.

## Utility Bonds Strong; Stocks Advance




**Bond market continued firm in November with evidence of additional strength in the high-grade utility group. "Electrical World" index, 106.3; October, 106.0. Utility stocks advanced this week, "Electrical World" index, 38.7; last week, 37.9**

## Utilities to Refund $132,000,000 of Debt

Registrations, petitions and public offering of $132,000,000 of public utility securities were made this week. Substantial savings in annual interest charges are expected to be achieved through the refunding programs.

Atlantic City Electric Company, subsidiary of American Gas & Electric Company, has filed a petition with the New Jersey Board of Utility Commissioners for authority to issue $18,000,000 of 3¼ per cent general mortgage bonds of 1963 to refund its present funded debt of $17,290,000 now outstanding. This is the first move in the general refunding program to be carried out by the system in the future.

Missouri Power & Light Company, subsidiary of North American Power & Light Company, controlled by the North American Company, has filed with the S.E.C. a registration statement covering an issue of $9,000,000 of first mortgage 3¾ per cent bonds due in 1966 and 15,000 shares of $6 cumulative preferred stock. Proceeds of the two issues will be used to retire a total of $8,768,000 of bonds, entire present debt, and will furnish the company with approximately $1,900,000 of new money to be invested in additional property, according to D. W. Snyder, Jr., president. The outstanding $6 preferred stock will be increased from 35,000 to 50,000 shares.

Connecticut Light & Power Company of Hartford, Conn., has filed registrations with the S.E.C. covering $16,000,000 of first and refunding mortgage 3¼ per cent bonds, Series G, due December 1, 1966. Net proceeds from the sale of the bonds, together with such funds as are required, will be applied to the redemption on January 1 of $8,530,500 of first and refunding mortgage 4¼ per cent, Series C, due July 1, 1956, at 105 and accrued interest, and $7,287,000 of first and refunding mortgage Series D, due July 1, 1962, at 105 and accrued interest.

Public offering of $12,000,000 first mortgage 3¼ per cent bonds of Consumers Power Company, subsidiary of Commonwealth & Southern Corporation, at 102 1/3 and accrued interest to yield about 3.11 per cent, was made this week. The bonds, due in 1966, immediately went to a premium, and was the third piece of financing by the company. The first two were refunding with the new issue constituting new capital.

Public offering of $35,000,000 first mortgage 3¾ per cent bonds, due 1966, and $9,500,000 of 4 per cent debentures, due 1946, of Oklahoma Gas & Electric Company was made this week. The bonds were offered at 102½ and the debentures at 100½, both commanding a premium after the offering.

Houston Lighting & Power Company of Houston, Tex., unit in the Electric Bond & Share system, has filed with the S.E.C. a registration statement covering $27,500,000 first mortgage 3½ per cent bonds, due 1966. Proceeds are to be used to refund on February 1, 1937 a like amount of outstanding debt.

Kansas Electric Power Company, subsidiary of Middle West Corporation, has filed declaration with the S.E.C. under the public utility act covering the issuance of $5,000,000 first mortgage bonds, Series A, due December 1, 1966, to bear interest not to exceed 4 per cent. Proceeds are to be used to redeem an equal principal amount of bonds now outstanding.

Public Service Company of New Hampshire, subsidiary of New England Public Service Company, has filed application for exemption from the requirements for filing a declaration under Section 7 of the utility act with respect to certain security issues. The company states that the Public Service Commission of New Hampshire has authorized $1,400,000 first mortgage 3¼ per cent bonds, Series F, due December 1, 1966; 11,500 shares of $5 dividend series preferred stock of no par value, and 10,000 shares of no par common stock.

The following utility companies have filed permanent registrations under Section 5 of the utility act, according to the S.E.C.; New England Public Service Company, Augusta, Me.; National Light, Heat & Power Company, Augusta, Me.; Twin State Gas & Electric Company, Rutland, Vt.; Interstate Gas & Electric Company, Chicago.

Central California Utilities Corporation of Los Angeles has applied for exemption under the utility act on the ground that its business and that of its subsidiaries is predominantly intrastate in character.

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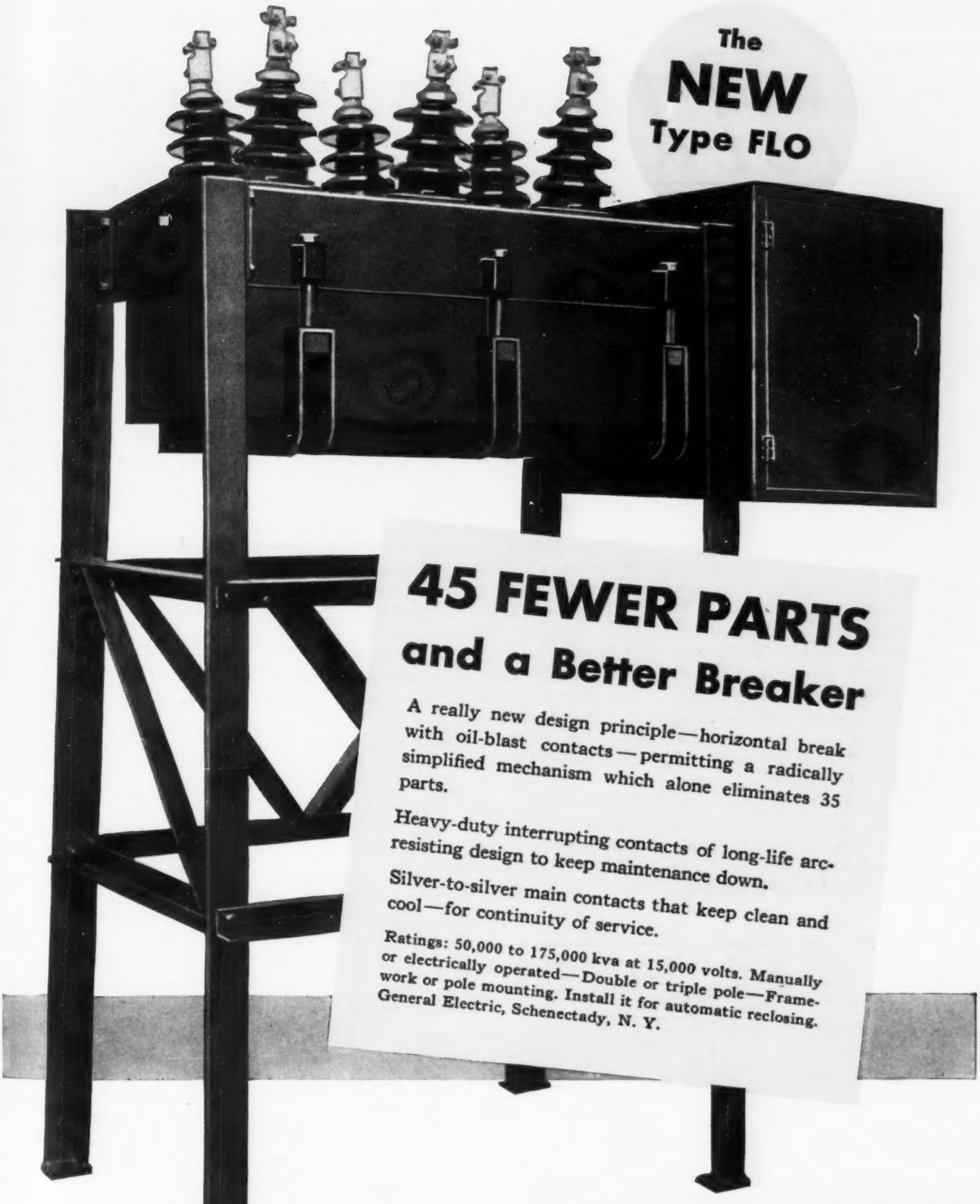
## Clarke Faces Fraud Charges by Utility

The fight between Harley L. Clarke, former president of Utilities Power & Light Corporation, and Floyd B. Odlum, president of Atlas Corporation, the investment trust which gained control of the company in 1935, broke out in the courts this week with the filing of two actions.

In one, the present management of Utilities Power & Light filed a civil suit, asking for an accounting of $3,000,000, which, it was alleged, Mr. Clarke, "misappropriated to his own use."

The other action was brought by Mr. Clarke, in which he petitioned the court asking permission to intervene in proceedings filed recently, in which reorganization of the utility is sought under Section 77-B.



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## 45 FEWER PARTS and a Better Breaker

A really new design principle—horizontal break with oil-blast contacts—permitting a radically simplified mechanism which alone eliminates 35 parts.

Heavy-duty interrupting contacts of long-life arc-resisting design to keep maintenance down.

Silver-to-silver main contacts that keep clean and cool—for continuity of service.

Ratings: 50,000 to 175,000 kva at 15,000 volts. Manually or electrically operated—Double or triple pole—Frame-work or pole mounting. Install it for automatic reclosing. General Electric, Schenectady, N. Y.

*More information in Bulletin GEA-2426.*

890-17

GENERAL ELECTRIC

# Field OPERATING PRACTICES

*New ideas and practices in the operation of well-designed, constructed and maintained plants and systems*

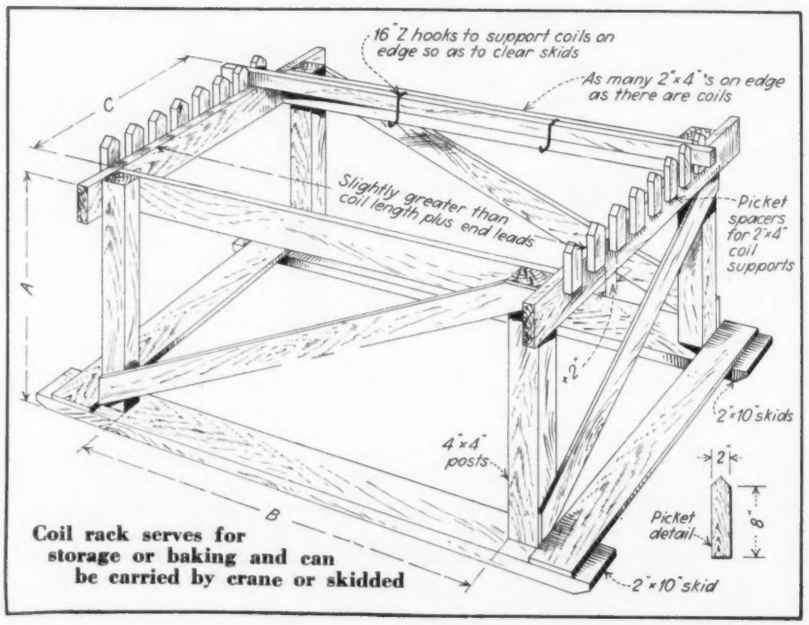
## Rack for Large Transformer Coils

When transformers of 1,500 kva., 22,000 volts and larger have to be taken apart for coil repair or replacements it is convenient to have a rack in which the coils can be hung after repair, for drying out in an oven, for shellacking and baking and storage until the unit is assembled. One such rack made for a shell-type unit of the rating mentioned is illustrated. This rack was made so it would be strong enough not only to support the dead weight (about 2 tons) but so it could be transported on rollers or by crane.

For this purpose the uprights were made of 4x4's and the skids and remainder of the frame of 2x10-in. planks, cross braced. The crosspieces at each end extend beyond the frame to serve as crane sling attachments. Fastened to these endpieces with slightly over 2-in. separation are wood pickets. These serve as separators for 2x4's, from which the coils are hung edgewise by Z hooks.

The inside longitudinal dimension of the rack was made just enough greater than the long dimension of the coils so they could be lowered onto the hooks without the end connections fouling. The height of the rack is such that the lower edges of the coils just clear the skids when suspended. One 2x4 is inserted at a time, with the hooks placed so as to minimize the bending stress on the coil insulation.

From the time the repaired coils are hung in this rack until they were assembled they can be handled individually by merely attaching a crane or hoist sling to the 2x4 support. Being supported by Z hooks the coils are readily accessible for shellacking, and drying and baking are facilitated.




**Coil rack serves for storage or baking and can be carried by crane or skidded**

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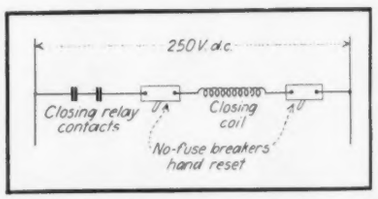
## Protection Devised for Closing Coil

Truck type oil circuit breakers are used in a Cleveland industrial plant as starting and running breakers for a group of synchronous motors driving some heavy rolls. Due to the very severe operating conditions, slight mechanical troubles have developed in the operating mechanisms of these breakers, which, while not amounting to much of themselves, have resulted in the solenoid-closing coil remaining energized and subsequently, in a short time, burning out.



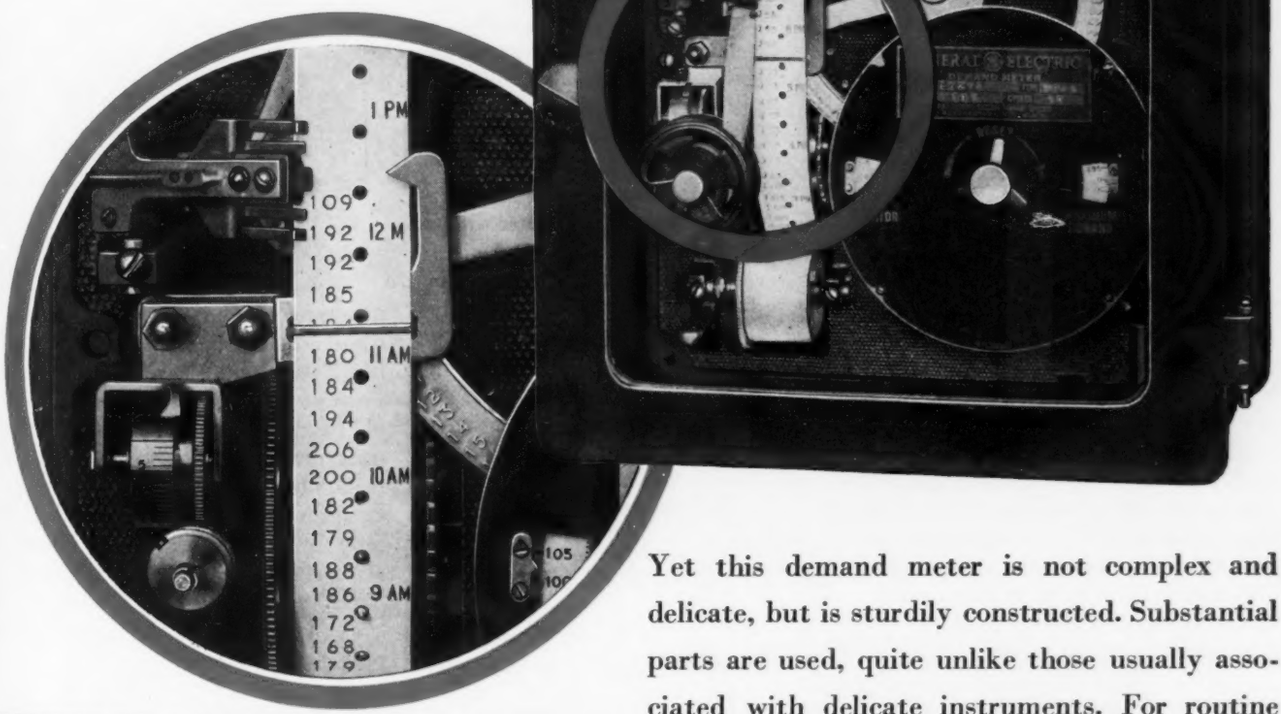

**Small breakers protect closing coil from burnout**

Experiments were carried out with thermal cutouts on each side of the closing coil and it was found that although these cutouts would very readily remove the coil from the line before it was damaged, lack of rupturing capacity caused them to burn up. While the coil drew 16 amp. at 250 volts, a cutout of from 8 to 10 amp. would carry the closing current and, in case the coil remained energized, would remove it from the line in 45 seconds.

Tests with "No-Fuze Flip-On"

# FOR YOUR IMPORTANT LOADS—

## THE *Printing* DEMAND METER




TYPE PD-5 demand meters have an accuracy especially suited to your important demand loads. Because these meters print their records, interpolation errors and also errors due to paper changes are negligible. As a result, a PD-5 can considerably improve your metering efficiency.

Yet this demand meter is not complex and delicate, but is sturdily constructed. Substantial parts are used, quite unlike those usually associated with delicate instruments. For routine inspection, the body is hinged so as to give a much-desired accessibility.

For further information, be sure to get in touch with your nearest G-E meter specialist, or write to General Electric, Schenectady, N. Y.

410-45

# GENERAL ELECTRIC

breakers of the same capacity produced the same results and left the breaker in good condition also, thereby solving the problem.

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# Reduces Dips Caused by Welder

By J. H. HUNT
Engineering Department,
The Toledo Edison Company

A single-phase welding load is usually a source of serious voltage dips on a distribution feeder, causing annoying lamp flicker. This is particularly troublesome if the load is connected to a feeder in a residential area and if the production schedule for welding runs into the night.

A specific case illustrates the seriousness of the problem and also what was done to minimize it. The welder is of the resistance type rated 200 kva., 440 volts and 445 amp. on the primary. It is served by a single-phase, 100-kv., 4,000-460-volt transformer connected across one phase of a three-phase feeder. The feeder supplying this load runs directly from the substation to the distribution load center, at which all branch circuits are tapped. Voltage at this point is held constant by an induction voltage regulator in the substation. The welder load is on a separate branch circuit about 1,000 ft. from the load center.

When first started the welder was adjusted for electrode voltage, weld pressure and duration of weld to give a satisfactory weld every 10 seconds and operated continuously. Every time it operated it caused a voltage dip in the lighting circuits from 118 to 109 volts. Oscillograms showed it was taking 1,053 amp. at 385 volts or 405 kva.—quite different from the rating—and the duration of each weld was 53 cycles. The feeder regulator operated every time a weld was made, overtraveling in the boost direction because of the short duration of the weld, and thereby aggravating conditions.

This pumping action of the regulator was entirely eliminated by reducing the reactive setting of the line-drop compensator. This caused under-compensation, but not enough to create difficulty. In addition, the pressure on the weld and the electrode voltage were greatly reduced, cutting the current to the welder to 548 amp. and the welding time to 26 cycles, but still producing satisfactory welds. When the pressure on the weld was reduced its resistance was increased, so that even though the current was reduced, the $I^2R$ heat was as much as had been previously obtained.

The net result was to reduce the voltage dips at the load center to 2 volts.

Since this experience additional welding has been added at the factory using the unit mentioned. To serve it a second 100-kva. transformer was paralleled with the first. This so improved the voltage regulation at the welder that it was possible to reduce its voltage to the lowest tap on the welding transformer, reducing dips still further at the load center.

The welders have now been operating several months, and although they operate during the evening lighting load peak the 2-volt dip has not proved objectionable to other customers on the circuit.

**Results Before and After Making Adjustments**

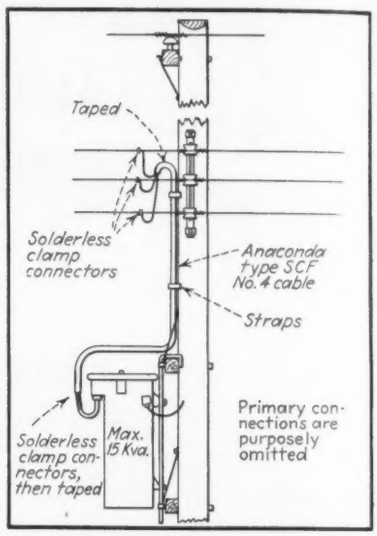
| | Before | After |
|---|---|---|
| Welder transformer tap, number | 15 | 1 |
| Primary amps (at 4000 volt) | 133 | 60 |
| Secondary amps (at 460 volt) | 1053 | 475 |
| Kw. | 152 | 77 |
| Power factor | 30 | 32 |
| Duration of weld (cycles) | 53 | 26 |
| *Voltage dip at Load Center | 9 | 2 |

* These values are on 115 volt basis.

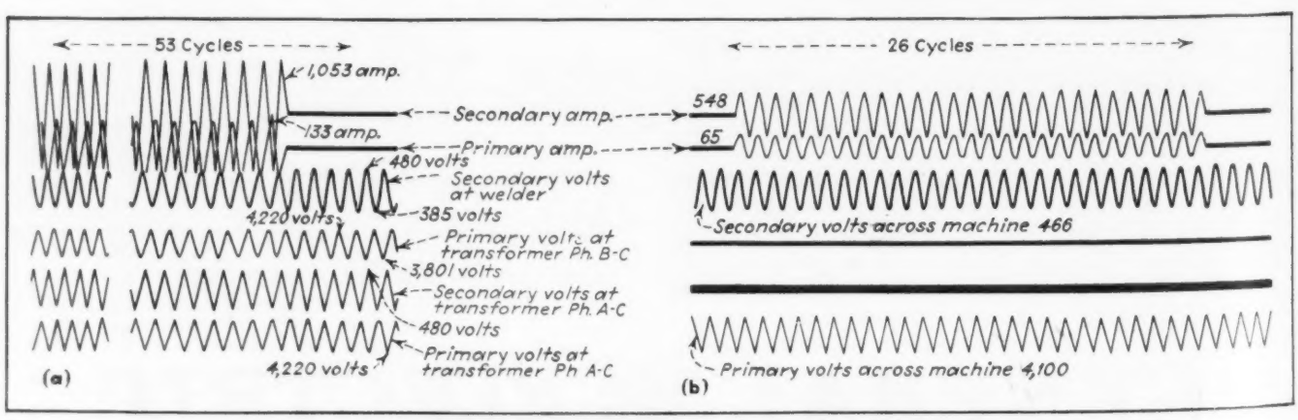
# Service Cable for Transformer Risers

By JOHN B. FOSTER
Department of Water and Light,
City of Ashland, Kan.

To conform to our program, combining neatness with maximum efficiency in rebuilding our distribution system, we decided to use as risers from transformers to secondaries the new type service entrance cable. For transformers up to and including 15 kva. we use a two-conductor, bare neutral type SCF (Anaconda) cable of No. 4 wire. Connections to the transformer and to the secondary are made using a solderless clamp type connector. The cable is held to the pole by means of straps. Such an arrangement gives a compactness of wires, abolishing their swinging in heavy winds, and adds to general appearance of construction.




**Transformer risers run with bare neutral cable**



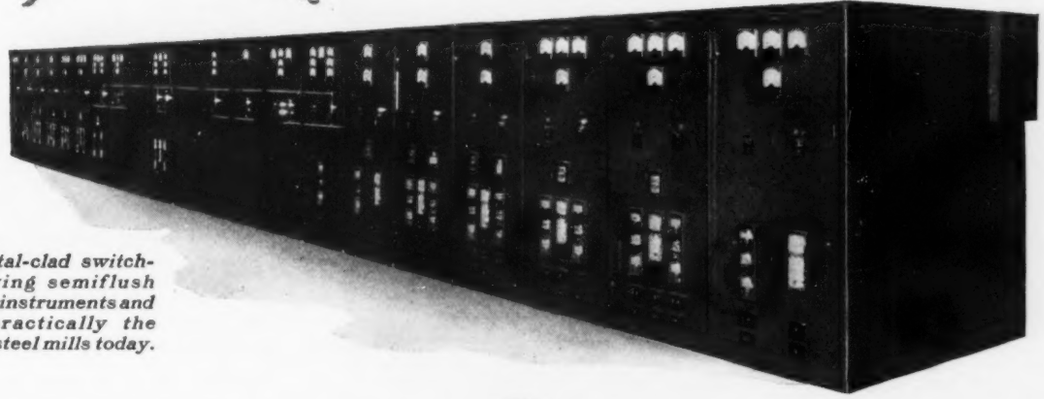

**Before and after adjusting electrode voltage and weld pressure**
(a) Welding transformer on No. 15 voltage tap. (b) On No. 2 voltage tap.

# The Lengthening Roll—

1933 [illegible] mill in Youngstown
1934 A cold-strip mill in Youngstown
1935 A blooming mill in Pittsburgh
1935 A hot-strip mill near Buffalo
1935 A cold-strip mill in upper Ohio Valley
1935 A hot-strip mill near Detroit
1935 A cold-strip mill near Baltimore
1936 A hot-strip mill in Pittsburgh
1936 A cold-strip mill in Pittsburgh
1936 A rod mill near Chicago
1936 A semicontinuous plate mill near Pittsburgh
1936 The Latest Job—48 units for a large power house in the Monongahela Valley

*All 500,000-kva G-E metal-clad switchgear. Shipped assembled—received complete, ready to operate*

**ALMOST without exception, new steel mills are installing metal-clad factory-assembled switchgear for high-voltage circuits. And the preference of steel men for G-E metal-clad not only continues; it continues to grow! They recognize that this type of switchgear is built for tough service, as steel-mill equipment must be built. To power men this should be significant—and is a proper basis for the selection of G-E metal-clad. General Electric Co., Schenectady, N. Y.**



*Typical metal-clad switchgear, showing semiflush mounting of instruments and devices—practically the standard of steel mills today.*

880-18

**GENERAL ELECTRIC**

# Industrial ELECTRIFICATION

*New ideas and practices in industrial electrification as presented by industrial, consulting and power sales engineers*

## Coil, Armature Oven Cuts Baking Time

A reduction in coil and armature baking time from nine to six and seven hours has been effected and a proportional reduction in operating costs realized by the installation of a modern electric baking oven at the Wausau, Wis., plant of the Marathon Electric Manufacturing Company. Saving in time effected by the use of this oven has resulted in a better production schedule in the factory and has made possible better service on rush orders.

Fresh air is brought up to oven operating temperatures of 225 deg. F. before entering the working chamber. A high capacity ventilating system distributes the air uniformly in the oven, insuring that large volumes of the air come in contact with the insulating varnish, thus preventing the occurrence of skin-dried or cooked coils. Volatile vapors are removed from the oven rapidly as they are formed.

Use of systematic oven ventilation makes operation possible at considerably lower temperatures, thus cutting power consumption to a low figure.

Additional saving in time can be effected by this company since one compartment of the two-compartment oven may be operated while the other is being loaded. Also since each compartment is a separate unit, it may be operated at a different temperature than the adjoining one. Thus one compartment may be used for drying coils while the other may be used for baking or any other combination that fits into the production requirements.

*Courtesy Despatch Oven Co.*

**Electric oven cuts coil and armature baking time 26 per cent**

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## Servicing Submerged Motors

The procedure of a leading New England repair shop (Electrical Installation Company, Cambridge, Mass.) in handling motor rehabilitation resulting from last spring's floods is of interest to operating engineers. Motors which have been submerged prior to being received at the shop are first washed out with water on an outdoor platform for one-half hour to two hours to remove silt and other foreign matter. They are then heated at 140 to 150 deg.F. in a steam coil oven 40 ft. long x 4 ft. wide x 4 ft. high, with plywood insulation and natural draft, for 8 to 24 hours, according to the condition and size of the motor. This is followed by washing the coils in place with naphtha to remove residue oil and grease, after which the motor is baked in a gas oven for 8 to 48 hours at a temperature of 235 deg. F., the duration depending on the trend of megger readings. Again washing with naphtha follows if oil bubbles out of the insulation.

The entire motor is next dipped in insulating varnish, baked in the gas oven from 8 to 14 hours at 235 deg.F., after which the air gap and frame are scraped clean and the windings given a finishing spray coat of insulating varnish. The insulation of the windings to ground is tested by megger at each stage. Alternating-current motors are tested from windings to ground

# So you're going MODERN

—which means more than scrapping obsolete machines, old-time line shafts, and ill-advised power-wasting small motors. In the larger sense, "going modern" today means *planned production*—scheduled and routed—and part of that picture is *Modern Group Drive*. This newer way of transmitting power to machines, combining the best of the two older systems (individual motor drive and line-shaft drive) interests every plant executive because it is *designed* for planned production.

★ ★ ★

Modern Group Drive calls for large motors for *groups* of machines and individual motors where required for *single* machines. With planned production this newer, more efficient system increases production and cuts costs. Compared to individual motor drive applied to machines indiscriminately throughout a plant, Modern Group Drive shows savings in installation, operation, maintenance and power costs that no business can afford to lose.

As a method of applying motor-power to production machines, Modern Group Drive is inherently more efficient because it uses *larger* motors with *better* power factor. These larger motors cost you from 35% to 85% *less* per motor horsepower. And you buy *less* motor horsepower for the same number of machines.

**SEND FOR FREE BOOKLET**

Our Red Book talks your language and tells with pictures and brief text why and where Modern Group Drive is more efficient and economical. Send for a copy today. Case studies are also yours for the asking. And at your call, without obligation, are Power Transmission Counselors throughout the country who cooperate with plant, consulting and public utility engineers in the modernization and installation of industrial power transmission systems.

**POWER TRANSMISSION COUNCIL**
**75 STATE STREET · BOSTON, MASSACHUSETTS**

*A research association of producers and distributors of power, power units and mechanical equipment for transmitting power.*

MODERN GROUP DRIVE PTC

# MODERN GROUP DRIVE

**–the *new* efficient and economical way of transmitting power to machines**

with double rated voltage plus 1,000 and direct-current motors are tested at 1,000 volts from winding to ground. The last step is to run the motor light on normal voltage for fifteen minutes to one-half hour. Field coils are tested for current and voltage drop and armatures of direct-current motors are given a "growler" test and millivolts drop to ground test. End bells and bearing chambers are cleaned by "cooking" them from 30 minutes to three hours in an electrolyte tank containing a special solution through which current from a 6-volt plating generator is passed, the iron of the end bell serving as a positive electrode and a copper plate as a negative terminal. The tank temperature is about 165 deg.F. and the use of this "reversed" electrolytic process frees the end bells of foreign matter.

Where rewinding of coils is necessary this company strips by special thin blade cutting tools driven by air hammer instead of by resorting to cold chisel and hand hammer. This insures clean slot ends and undamaged laminations. Coils are wound on adjustable link winders in proper groups, insuring correct shape and size of coils and a minimum number of soldered joints. Winding is by mesh-laid coils, with varnished cambric between each coil and two layers of cambric at phase points. No impregnation is attempted until the windings are thoroughly dehydrated by heating, then immersed in varnish and baked, the process being repeated two or three times. Instead of a melting-on compound which tends to soften under overload conditions, resulting in rough finish, a varnish base compound is used which is set under heat and which cannot run.

A few figures as to the cost of reconditioning motors exclusive of transportation charges to and from the shop in connection with the floods in New England follow. These costs to the motor user are based on 1,200-r.p.m. frames and are readjusted as required to take account of slower speed units of larger frames and rotors. Alternating current three-phase motors, ½ to 2 hp., 1,200 to 1,800 r.p.m., $10 each; 3-hp., $15; 5 hp., $17; 7.5-10 hp., $20; 20 hp., $25; 25 hp., $30; 50 hp., $1 per hp., plus $5 flat; 75 to 100 hp., $1 per hp. flat. Slower speed motors in typical cases would run as follows: 35 hp., 500 r.p.m., $75, and 50 hp., 800 r.p.m., the same. A 100-hp. motor at 900 r.p.m. would cost about $125 for reconditioning. Rewinding is not included in these figures.

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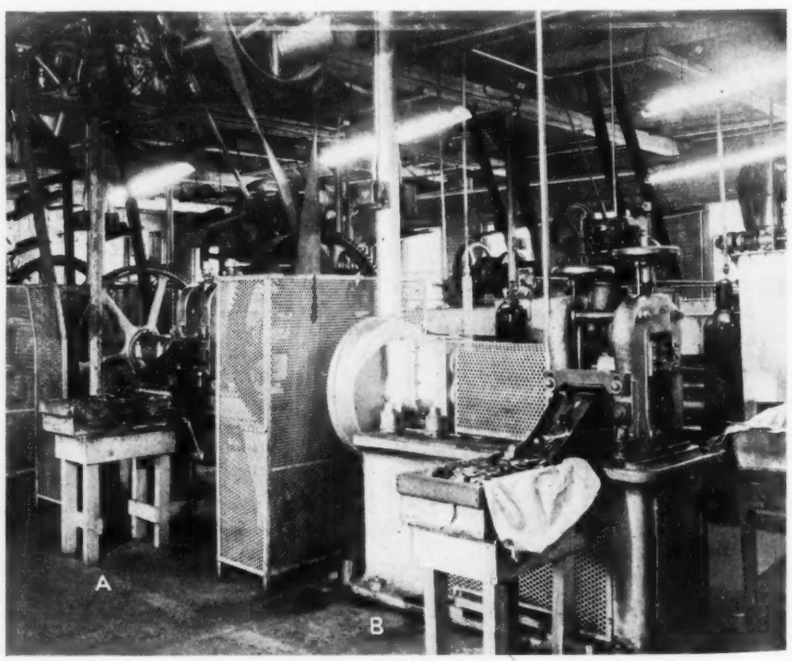
## Self-Contained Roll Drive Advantageous

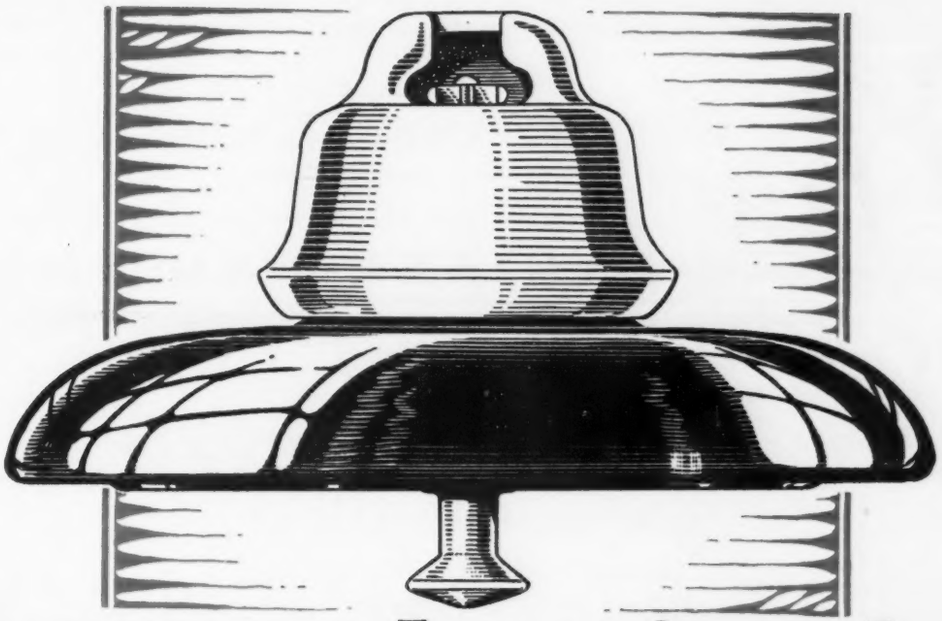
At the factory of Reed & Barton, Taunton, Mass., various motor drives have lately been modernized to secure the benefits of more positive service, increased clearance in the vicinity of productive machinery, greater cleanliness and the economies resulting from shutting down motors when certain units are not in use. In the spoon shop an interesting example is found of a direct-driven grade roll with motor mounted inside the frame, working beside the older type of belt-driven roll for similar service. The direct-drive machines were made by Standard Machinery Company, Auburn, R. I., and belt-drive machines by Waterbury Farrel Foundry & Machine Company, Waterbury, Conn., and are utilized in widening and "grading" spoon blanks by passing the stock lengthwise through a combination of eccentric and cylindrical rolls. These rolls serve to vary the thickness of different portions of the spoon, leaving plenty of metal at the neck to provide sufficient strength, and reducing the gage of the central part of the section which ultimately becomes the bowl. Grading aids in the shaping of the handle and is also applied to fork strips before the blanks are stamped out.

The latest individually powered rolls, shown at the right, are equipped with a 10-hp., 550-volt, three-phase motor running 1,160 r.p.m. and located in the base of the machine. Through three sets of gearing and a 1 to 1 herringbone gear connecting with so-called "wobbler" shafts driving the rollers, a final speed of only 26 r.p.m. is obtained where the stock passes through the mill. The required tolerance is expressed in thousandths of an inch. Bearings are of the roller type and the gearing runs in oil. The Reed & Barton company states that the individual drive provides increased power and sustained energy input; also that in three years' service no maintenance costs have been incurred. While the belt-driven units gave good service on the group plan, their over-all compactness was less, and gave less open space in the shop. The protection of operators by screening exposed gears was simpler with the individual drive, and the production rate was perhaps 5 to 10 per cent better with the self-contained motor layout.




**Group vs. individual drive of grade rolls**

"A" shows a roll of the belt-driven type and "B" a set of rolls driven by a 10-hp. inclosed motor. Release of factory space and simplification of drive obtained by mounting the motor inside the frame and reducing the speed from 1,160 to 26 r.p.m. by gearing changes in oil have given the user marked advantages in power economy and steadiness of production.



# You can reduce insulator breakage to a minimum

Insulator breakage—whether accidental or malicious—is expensive, but it is also largely avoidable. In many cases where the ordinary insulator breaks, Locke Insulators continue to operate unharmed, minimizing maintenance and replacement costs, and safe-guarding your lines against expensive outages.

It is no accident that Locke Insulators are so much stronger. Their high resistance to breakage is the direct result of years of intensive ceramic research.

Nor is it an accident that Locke Insulators are preferred by so many utilities. Their own service records have definitely shown them that Locke Insulators are easier to handle, save time and give additional years of satisfactory service.

LOCKE

PORCELAIN INSULATORS

LOCKE INSULATOR CORPORATION BALTIMORE MARYLAND

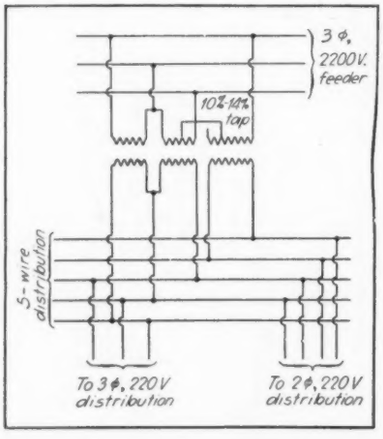
# New ENGINEERING IDEAS

*Discoveries, proposals and developments by electrical engineers and scientists in the field, the factory and the laboratory*

## Transformers Yield 2- and 3-Phase Power

By H. G. HOCKMAN
Michigan Public Service Company, Cheboygan, Mich.

A unique system of transformer connections which makes it possible to supply both three-phase, three-wire, 220-volt and two-phase, four-wire, 220-volt service simultaneously from the same bank of transformers has been developed by engineers of the Michigan Public Service Company to meet certain conditions imposed by changes in the distribution system.




**Connection delivers both two- and three-phase power from one transformer bank simultaneously**

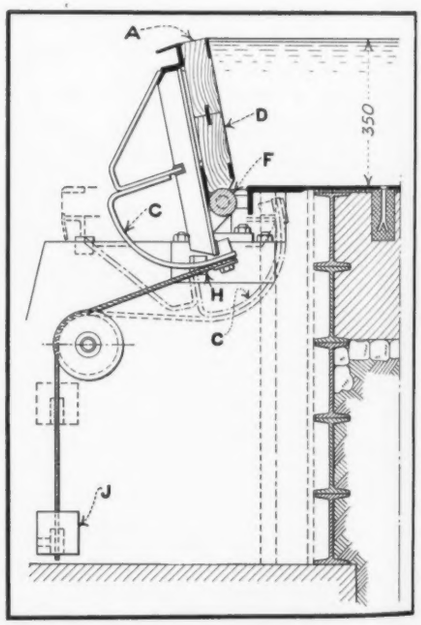
In this territory two-phase, four-wire, 220-volt service was originally established as standard. Original primary system was two-phase, four-wire, 2,300 volts. Recently, however, the city of Cheboygan installed new pumps and motors at its pumping station and requested three-phase, three-wire, 220-volt service. At that time it was decided to change all present two-phase, four-wire primaries to three-phase and to change all power banks to Scott or three-phase-two-phase banks. This permitted serving all present customers with two-phase power. It, however, involved the problem of serving three-phase motors which would be added to the loads of existing two-phase power customers. Thus it became necessary to supply both two- and three-phase power simultaneously.

To meet this condition the set of connections illustrated was developed and a five-wire distribution circuit was run to all businesses requiring both two- and three-phase service. This system requires the addition of but one feeder wire to existing two-phase, four-wire circuits and one transformer to any existing Scott-connected bank of transformers. The only special feature required on standard transformers is the necessity of bringing out the center tap on the high-voltage side of the winding through the transformer case with a standard 2,300-volt bushing. The other transformer in the Scott bank must have the standard 10 per cent tap to give the ratio of 9/1. If this standard transformer has the 14 per cent or 15 per cent tap it should be used in order to provide better voltage balance.

In cases where motors developed bad starting characteristics due to unbalanced voltage a small voltage booster was connected in the circuit to balance the voltage. Motors usually operate satisfactorily without boosters. In general, standard transformers with standard taps have been found to be satisfactory for all operating conditions.

## Automatic Flap Weir Cuts Flood Damage

Considerable difficulty was experienced by operators at the Wunderklingen pumping station, Switzerland, in removing stop logs from an old-fashioned weir dam during periods of high water. Frequently the logs or flashboards could not be removed with sufficient dispatch to prevent flooding adjacent cultivated land. It was therefore decided to install an automatic weir in order to overcome this difficulty. The weir installed, which is shown in the accompanying illustration, is said to involve low initial




**Balanced flaps in automatic weir drop down on advent of high water, thus relieving flood conditions**

# NEW SECTIONALIZING CUTOUT DEVELOPED—ISOLATES OUTAGES TO RESTRICTED AREAS

## Costs, Troubles and Hazards On Series Street Lighting Circuits Materially Reduced

## *Kearney Series Sectionalizing Cutout Gains Instant Approval After Field Tests Are Made*

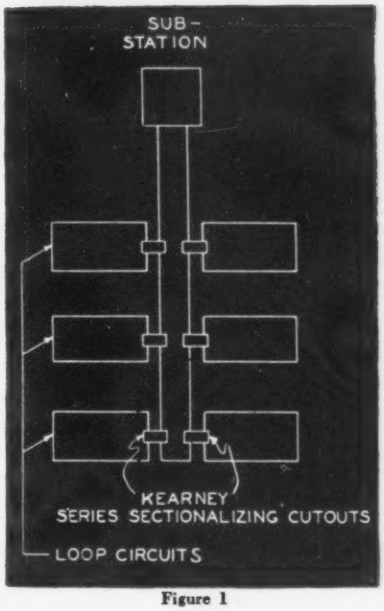
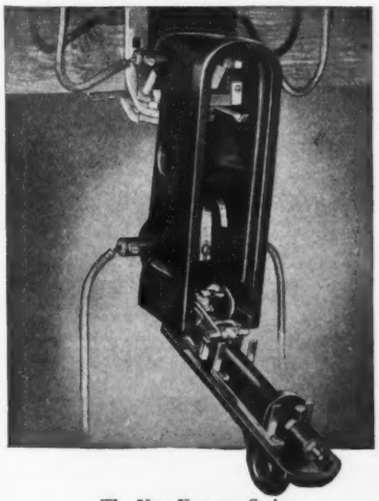



Figure 1

Responding to requests from the field that something be done about isolating outages on street lighting circuits, so that long, tedious patrols would not be necessary in the event of an outage during a storm, the James R. Kearney Corporation has designed and developed a new cutout which reduces costs, troubles and hazards on series street lighting circuits commonly used throughout the United States.



The New Kearney Series Sectionalizing Cutout

The application of the Kearney Series Sectionalizing Cutout to a series circuit is shown by figure 1. Figures 2 and 3 show the principle which governs the operation of the cutout.

Figure 2 shows four stationary contacts, the upper two of which have connected to them the incoming and outgoing leads of the main circuit. Likewise, the incoming and outgoing leads of the loop circuit are connected to the lower contacts. Two switch blades engage the upper and lower contacts on either side to complete the connections from the main circuit to the loop circuit for normal operation. There are connected across the main circuit, in the manner indicated, a gap and fuse link which are in series. The gap is calibrated to break down at a voltage higher than the loop circuit voltage and lower than the open circuit voltage of the constant current transformer. The auxiliary switch, which in its closed position provides a direct connection across the upper main terminals, is restrained in its open position during normal operation.

When an open occurs on the loop circuit, the voltage across the gap immediately increases to open circuit voltage of the constant current transformer. The gap then sparks over, establishing a circuit through the fuse link which blows.

As this happens the switch blades, fuse tube and spark gap assembly are released from the normal operating position, leaving the circuit connections as shown in figure 3. The upper and lower contacts are no longer connected, thus the loop circuit is completely isolated electrically from the main circuit—and further, the auxiliary switch has operated to provide a straight through connection for the main circuit.

If you are interested in greater protection, less hazards and increased savings on your series street lighting operating costs, order a quantity of these new cutouts—install them—then watch the satisfactory results.

*FOR INFORMATION AND PRICES*
*Write* **JAMES R. KEARNEY CORP., 4224 Clayton Blvd., St. Louis, Mo.**

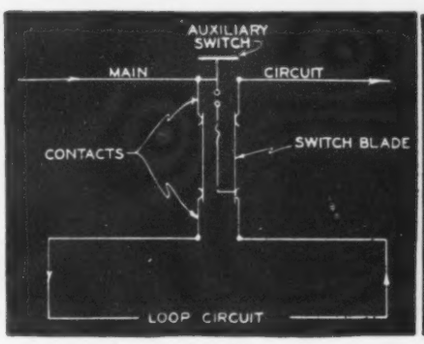



Figure 2

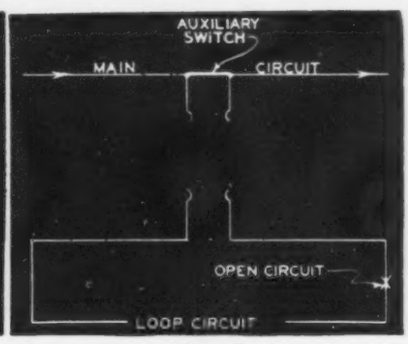



Figure 3

cost, is simple in construction, reliable in operation and requires no attendance.

Eleven flaps (A) working independently of one another comprise the moving part of the weir. Under normal conditions of flow the flaps are pressed slightly against the stops (H) by the torque exerted by the counterweights (J) acting on the quadrant (C). This pressure is, however, limited in such a way that a rise in water level in the head race exerts sufficient hydraulic pressure on the planking to cause turning of the flaps against the torque exerted by the counterweights. When the flaps are completely turned down the surface of the planking (D) lies in the same plane as the crown of the dam. Floodwater can then flow over the whole width of the weir. The river may be impounded to 1.15 ft. for a width of 94 ft. with the aid of the flaps.

Suitable dimensioning of the counterweights makes it possible for any number of flaps to be turned down one after another or simultaneously so that fish, wood, foliage, etc., can be led off at any desired part of the weir.

This weir, which was described in *Escher-Weiss News* (Swiss) was put in service in 1934 and has given completely satisfactory service under medium and high water conditions. The highest rise of water for which weirs of this type have been built up to the present time is 2.5 ft., the width of the river being about 165 ft.

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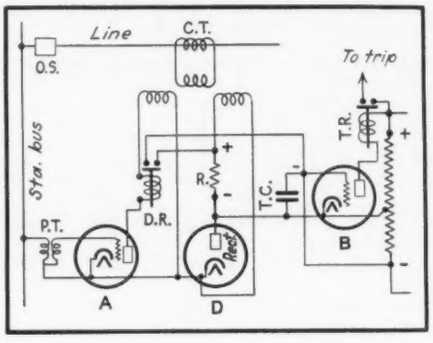
# Electrons Operate Directional Relay

By R. I. WARD
Testing Laboratory,
Commonwealth Edison Company, Chicago

Under severe fault condition, voltage on a station bus may be pulled so low as to prevent the functioning of reverse power relays of the induction type which depend on the relationship between potential and current for operation. Yet it is under such conditions that it is most necessary for directional power relays to go into action. To avoid this inherent defect of the induction relay there has been devised a new thermionic directional power relay whose general scheme is disclosed in the accompanying diagram.

The grid of the vacuum tube, *A*, is connected to one side of a potential transformer on the station bus. The plate of this tube is tied through the relay *DR* to one terminal of a double secondary insulating transformer whose primary is energized by a current transformer on the line. The return circuits of the potential and insulating transformers are from the cathode of the tube *A*. The phase relationship of the voltages on the grid and plate of this tube is such that reversal of energy in the line allows sufficient plate current to flow to close




**Electron tubes make a reverse power relay**

the contacts of relay *DR*. Reduction of grid potential caused by station bus voltage being pulled down by a fault and simultaneous rise of plate potential caused by heavy line fault current results also in plate current and operation of the relay under conditions in which an induction relay might fail to operate.

The remaining elements in the circuit scheme as shown are for adding the time delay feature to the relay operation. Direct current positive potential from a simple voltage divider is applied to the plate of vacuum tube *B* through the trip relay *TR*. The grid of this tube is held normally negative in relation to the cathode by their connections to the voltage divider. Connected between the grid and cathode is a tank condenser, *TC*. The second secondary of the insulating transformer is connected directly across the rectifier tube, *D*, with positive and negative taps on the two sides of a resistance, *R*, in the plate leg, connected respectively to the grid and cathode of tube *B*, the positive grid connection being through the contacts of relay *DR*. Thus, when relay *DR* closes, a positive potential is introduced into the grid circuit of the tube *B*, and the magnitude of that potential is a direct function of the current in the line. Inversely dependent on this magnitude is the time required to reverse the charge in the tank condenser and to make the grid of the tube *B* positive. When this occurs, plate current flows in *B* and the relay *TR* closes, actuating the switch-tripping mechanism. The diagram thus shows a reverse current relay scheme with inverse time delay that includes no mechanical operations except two simple and very light relay closures and that will function in the condition of very low bus voltage caused by a fault.

The circuit employed in actual use is, of course, more elaborate than the simple scheme of essential elements shown in the diagram. For clarity of description, certain necessary resistances and capacitances are not included in the scheme as shown. It is obvious that proper location of such units, selection of their values and choice of vacuum tubes for their operating characteristics can result in a directional relay to fit almost any desired requirements.

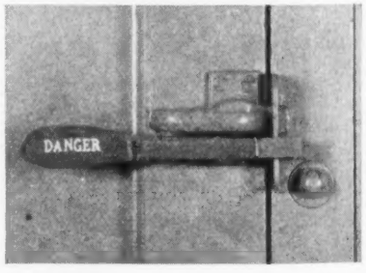
A reverse power relay of the thermionic type was placed in service to determine the life characteristics of vacuum tubes under actual service conditions. After 2½ years of service the relay showed no apparent signs of deterioration, the vacuum tube characteristics remained constant during the test. Another point of interest is the tube life indicator circuit. The circuit consists of an alarm circuit which is operated when deterioration occurs in the tubes. This circuit is not shown on the diagram as this article was written primarily to show the operating principle of the relay.

•

# Simple Device Prevents Accidents

Ordinary spring-type clothespins modified as shown and painted a brilliant red are being used as part of a systematic safety plan by the Public Service Electric & Gas Company to call the attention of repairmen to substation compartments housing energized equipment.

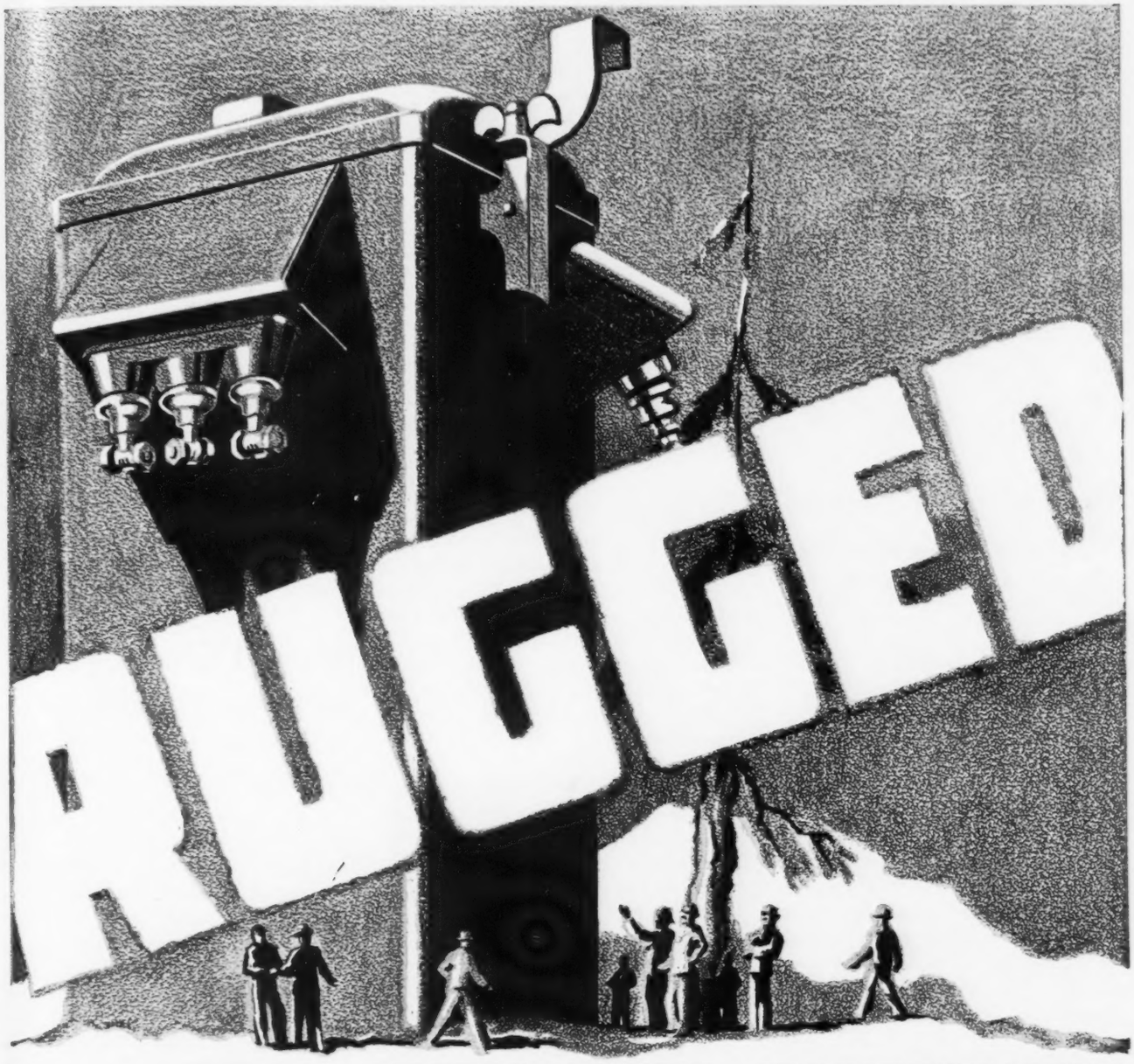
These "safety pins" are snapped to the compartment latch by the station operator and must be removed




**Safety pin attached to compartment door indicates energized equipment**

before it is possible to open the door. This fact makes it unlikely that mechanics working in adjacent compartments would contact the energized equipment in the belief that it was "dead."

A simple device such as this provokes that "second thought" on the part of the workmen which often means the difference between a good and a bad safety record.




## DISTRIBUTION TRANSFORMERS

**L-M Transformers are built to "take it". Heavy insulation plus coordinated stud type bushings guard against lightning. Sturdy coils stand up under short circuit stresses. Rectangular core type construction decreases burnout danger. Every part, from core to sheet steel tank, is rugged . . . built for long life and low maintenance. See the cutaway L-M Transformer next time your L-M salesman calls. . . . Write for Catalog T-2.**

# LINE MATERIAL CO.

SOUTH MILWAUKEE, WISCONSIN, U. S. A.

# Building Up THE LOAD

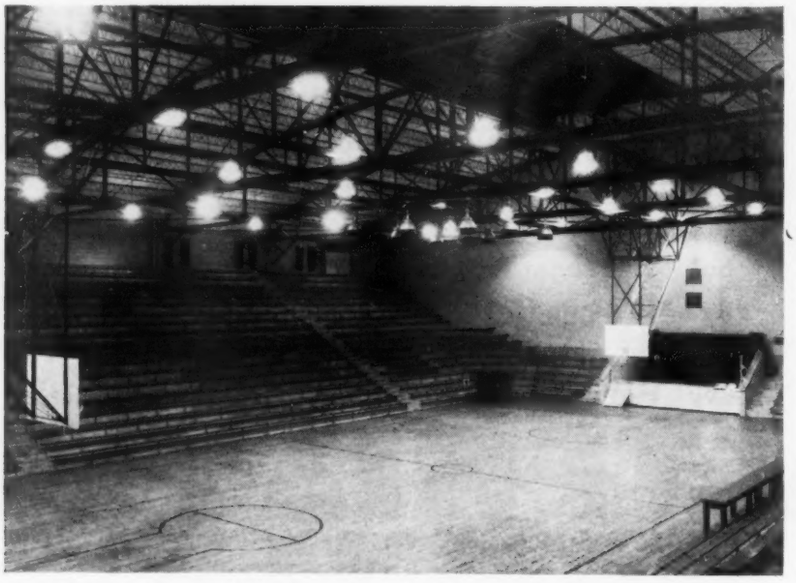
*New ideas and practices in selling electrical equipment and service to industrial, commercial and domestic customers*

## Modern Gym Lighting Nets 50 F.-C. on Floor

By AKSEL KNUDSTRUP
Lighting Engineer Potomac Electric Power Company, Washington, D. C.

One of the country's most outstanding gymnasium lighting installations is to be found in the Ritchie Colosseum of the University of Maryland, College Park, Md. Here are installed 1,000-watt prismatic glass units on 14-ft. centers at a height 22 ft. from the floor, giving an intensity of 50 ft.-candles. In addition to this, a special boxing ring lighting unit is installed which uses nine 1,000-watt units on a steel frame which may be hoisted out of the way by means of a winch, thereby clearing the gymnasium for basket ball. Illumination in the boxing ring provided by this unit is about 300 ft.-candles, remarkably free from shadows.

Better lighting has been attained at the University of Maryland by the process of actual demonstration and making surveys of lighting jobs. The authorities and the athletic coaches were shown that the best lighting jobs would be obtained by using the system as shown in the illustration. The author designed the complete lighting job and wrote all the necessary specifications for the completed lighting installation. Engineering service was then rendered on the actual installation to insure a completely satisfactory lighting job. The resultant installation proved to be very satisfactory, the authorities being so well pleased that they in turn called for information on every lighting project at the University of Maryland. The result has been that better and more adequate lighting is obtained in all newly constructed buildings at this institution.



**Even illumination of 50 ft.-candles is attained on gymnasium floor with units mounted at 22 ft. Note boxing ring unit in retracted position**

•

## Rural Lighting Free of Some Handicaps

By LAWRENCE C. PORTER
In Charge of Rural Lighting, Nela Park, General Electric Company, Cleveland

We are entering an era of rapid expansion of electric service in rural territories. During 1936 the utilities will spend approximately $50,000,000 for rural electrification. Their new lines will serve approximately 157,000 new rural customers. Farm co-operatives are building lines to serve 60,000 more customers.

Most of the farmers whose homes and barns will be wired this year have previously used kerosene lamps. They do not realize the fact that lamps having the high brilliancy of the tungsten filament and thousands of lumens output instead of ten or fifteen cannot be handled like the old kerosene lamp. Neither do they realize the advantages to be gained from the use of higher wattage lamps properly used and equipped with efficient shades and reflectors.

These new customers are intelligent and progressive. They are anxious to learn. While they may not be able to afford all or the best of electrical equipment immediately, there is so little difference in cost between mediocre and the best of lighting that most of them can and will install the best provided some one tells them what that is and where and how to get it.

The lighting industry has a great

# A Complete Classified Index of the products of 3500 Electrical Manufacturers

Looking for an electrical product? If you are, you can learn who makes it quickly in the Buyers Reference Number of Electrical World. Or if you know only the manufacturer's name or the trade name, the Trade Name and Company Index in this same volume will answer your needs in a jiffy.

In addition, you will find the Product Exhibit Section most helpful in locating branch offices, warehouses, etc.

This handy guide to everything electrical should prove quite helpful in planning your 1937 purchases.

ELECTRICAL WORLD
330 West 42nd St., New York, N.Y.
*Headquarters for Everything Electrical*

SUPERIOR
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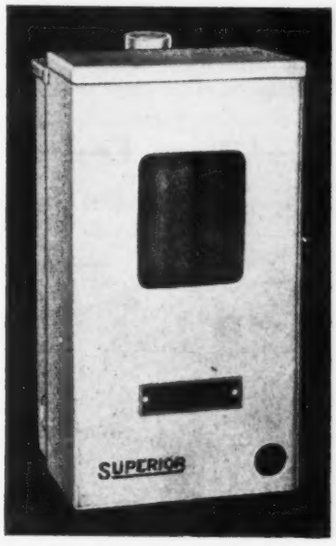
*(BAIS-20)

## HERE'S THE MOST ALERT WATCHMAN YOUR MONEY CAN HIRE!




**Let Superior Meter Enclosures watch over your revenue.**

Put your naked meters in Superior Enclosures. Discourage current diversion —Eliminate fire and safety hazards—treat your meters like you do your cash and records — Lock 'em up.

Our business is to help you get paid for all energy consumed. "Ask and ye shall receive" A "Compact Enclosure Bulletin".

**Superior Switchboard & Devices Co.**

Canton, Ohio

*Been at it Since 1920

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opportunity in the rural field. It does not have to start off with inadequate wiring, nor with poor equipment, and then work hard to try to improve it. Today it is well known what good lighting consists of and there is plenty of moderately priced equipment available to produce it. Instead of the 25- and 40-watt lamps which the farmer probably contemplates, 100- and 150-watt Better Sight lamps can easily be sold the farmer when their advantages are understood by him.

There are on the average 30 lamps on each farm. Multiplying this by the number of farms that will be connected to high line service in 1936 we contemplate some 6,500,000 new lamp sockets this year that may be equipped with 25- or 100-watt lamps. Which shall it be?

In addition to the lamps used for lighting these newly wired farms there is a large potential field for additional lighting load in greenhouses, roadside vegetable stands, gas stations, floodlighting for night work on the farm, etc. The field for plant-lights, sunlamps, infrared lamps, lighted insect traps, etc., in these rural homes, in dairies, poultry farms, etc., is almost untouched. Their load-building possibilities are fully as great as that of much of the more expensive equipment, and they are more easily sold on account of their lower cost.

•

## Adds 500 Hp. in Air Conditioning

Air conditioning is assuming increasing importance as a load builder. An example is seen in the accompanying table of 47 such installations taken on during the first eight months of 1936 by the Florida Power & Light Company in its Miami area.

Theatres lead in magnitude of individual loads, those here listed ranging from 48 to 80 hp., and from 4.7 to 8.7 hp. per hundred seats, with an average of 6.5 hp. per hundred seats. Drug stores, banks and hotels are also seen to be good prospects. Residence loads are small, generally less than one horse-power, and in the light of the stated floor areas they seem to be confined to single rooms, but they are relatively numerous. One installation out of every four is in that class.

Omitting five residences, two offices and one drug store, for which figures are not given, the table accounts for 469 hp. of new connected load.

The population in the Miami area is approximately 125,000, with a large seasonal fluctuation.

**Air-Conditioning Loads Taken on During First Eight Months of 1936, by Florida Power & Light Co.**

| | Use or Business | Month Instal. Comp. | Type System | Functions | | | | | Space Served | | | Max. Cooling Load, Btu./Hr. | Refrigeration | | | Water Supply | | | Comp. Load, Hp. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Cool | Dehum. | Heat | Humid. | Filter | Floor Area, Sq. Ft. | Vol. C, Cu. Ft. | Seats | | Type | Rated Tons | Hp. | City | Wells | Cooling Tower | | |
| 1 | Instr. room | Jan. | Unit | x | x | x | .... | x | ..... | ..... | ..... | 23,500 | Elec... | 2.00 | 2.12 | Evap. cond. | | | 2.17 | 1 |
| 2 | Residence | Jan. | Unit | x | x | x | .... | x | 140 | 11.2 | ..... | 6,200 | Elec... | 0.63 | 0.75 | Air cooled | | | 0.77 | 2 |
| 3 | Funeral home | Jan. | Unit | x | x | x | .... | x | 168 | 16.8 | ..... | 7,000 | Elec... | 0.63 | 0.75 | Air cooled | | | 0.77 | 3 |
| 4 | Residence | April | Central | x | x | ..... | .... | x | 859 | 68.5 | ..... | 15,325 | Elec... | 1.62 | 2.0 | Air cooled | | | 3.33 | 4 |
| 5 | Residence | April | Unit | x | x | ..... | .... | x | ..... | ..... | ..... | ..... | Elec... | 1.50 | 2.0 | ..... | | | 2.02 | 5 |
| 6 | General office | May | Unit | x | x | ..... | .... | x | 465 | 58.8 | ..... | 15,000 | Elec... | 1.62 | 2.0 | Air cooled | | | 2.01 | 6 |
| 7 | Private offices | August | Central | x | x | ..... | .... | x | 378 | 36.0 | ..... | 13,824 | Elec... | 1.50 | 1.50 | x | | | 1.62 | 7 |
| 8 | Retail store | July | Central | x | x | ..... | .... | x | 1,800 | 270.0 | ..... | 52,873 | Elec... | 5.00 | 9.25 | | | x | 10.00 | 8 |
| 9 | Bank | July | Central | x | x | ..... | .... | x | 560 | 101 | ..... | 28,110 | Elec... | 2.42 | 3.01 | Evap. cond. | | | 3.21 | 9 |
| 10 | Residence | July | Unit | x | x | ..... | .... | x | 180 | 16.2 | ..... | 6,000 | Elec... | 0.58 | 0.50 | x | | | 0.52 | 10 |
| 11 | Apparatus room | August | Central | x | x | ..... | .... | x | ..... | ..... | ..... | 58,000 | Elec... | 5.00 | 6.00 | | x | | 8.00 | 11 |
| 12 | Theater | May | Central | x | x | ..... | .... | x | 7,650 | 138 | 865 | 684,150 | Elec... | 53.00 | 60.00 | Evap. cond. | | | 72.00 | 12 |
| 13 | Ladies apparel | June | Central | x | x | ..... | .... | x | 1,260 | 176 | ..... | 53,000 | Elec... | 4.90 | 6.00 | | x | | 6.50 | 13 |
| 14 | Residence | July | Unit | x | x | ..... | .... | x | 288 | 26 | ..... | ..... | Elec... | 0.63 | 0.75 | Air cooled | | | 0.77 | 14 |
| 15 | Residence | July | Unit | x | x | ..... | .... | x | 128 | 11.5 | ..... | ..... | Elec... | 0.63 | 0.75 | Air cooled | | | 0.77 | 15 |
| 16 | Bank | July | Central | x | x | ..... | .... | x | 9,330 | 186.6 | ..... | 392,000 | Elec... | 31.60 | 33.00 | Evap. cond. | | | 40.67 | 16 |
| 17 | Residence | July | Unit | x | x | ..... | .... | x | 150 | 13.5 | ..... | 7,600 | Elec... | 0.75 | 0.75 | Evap. cond. | | | 0.77 | 17 |
| 18 | Private office | July | Unit | x | x | ..... | .... | x | 96 | 9.6 | ..... | 7,000 | Elec... | 0.75 | 0.75 | Evap. cond. | | | 0.77 | 18 |
| 19 | Private office | July | Unit | x | x | ..... | .... | x | 140 | 12.6 | ..... | 7,400 | Elec... | 0.75 | 0.75 | Evap. cond. | | | 0.77 | 19 |
| 20 | Residence | July | Unit | x | x | ..... | .... | x | 150 | 13.5 | ..... | 7,600 | Elec... | 0.75 | 0.75 | Evap. cond. | | | 0.77 | 20 |
| 21 | General office | July | Central | x | x | x | .... | x | 4,670 | 550.0 | ..... | 155,000 | Elec... | 12.50 | 11.50 | Evap. cond. | | | 13.67 | 21 |
| 22 | Drug store | August | Central | x | x | ..... | .... | x | 3,150 | 441.3 | ..... | 240,000 | Elec... | 20.00 | ..... | Economiser | | | 23.62 | 22 |
| 23 | Operating room | July | Unit | x | x | ..... | .... | x | 225 | 22.5 | ..... | 11,000 | Elec... | 0.75 | 0.75 | Evap. cond. | | | 0.77 | 23 |
| 24 | Shoe store | September | Unit | x | x | ..... | .... | x | 1,010 | 151.0 | ..... | 77,500 | Elec... | 7.50 | 7.75 | Evap. cond. | | | 8.12 | 24 |
| 25 | Residence | August | Unit | x | x | ..... | .... | x | 150 | 13.5 | ..... | 7,500 | Elec... | 0.75 | 0.75 | Evap. cond. | | | 0.77 | 25 |
| 26 | Kitchen pantry | July | Unit | x | x | ..... | .... | .... | 110 | 11.0 | ..... | 8,400 | Elec... | 0.75 | 0.75 | Air cooled | | | 0.77 | 26 |
| 27 | Hotel rooms and bar | September | Unit and Cent | x | x | ..... | .... | x | ..... | ..... | ..... | 192,000 | Elec... | 17.80 | ..... | | | x | 25.63 | 27 |
| 28 | Residence | September | Central | x | x | x | .... | x | 3,300 | 299.5 | ..... | 98,400 | Elec... | 7.40 | ..... | Evap. cond. | | | 8.42 | 28 |
| 29 | Grocery store | August | Central | x | x | x | .... | x | 5,190 | 622.8 | ..... | 171,790 | Elec... | 15.00 | 16.50 | | x | | 17.50 | 29 |
| 30 | Drug store | September | Central | x | x | ..... | .... | x | 2,700 | 405.0 | ..... | 145,160 | Elec... | 16.50 | 16.50 | | x | | 17.50 | 30 |
| 31 | Night club | September | Central | x | x | x | .... | x | ..... | ..... | ..... | 384,000 | E & G. | 13.33 | ..... | | x | | 25.00 | 31 |
| 32 | Men's shop | September | Central | x | x | ..... | .... | x | 4,664 | 528.4 | ..... | 187,820 | Elec... | 16.50 | 16.50 | | x | | 17.25 | 32 |
| 33 | General offices | September | Unit | x | x | x | .... | x | 3,335 | 27.5 | ..... | 20,155 | Elec... | 1.16 | 1.50 | Air cooled | | | 1.75 | 33 |
| 34 | General offices | August | Unit | x | x | ..... | .... | x | 900 | 90.0 | ..... | 39,600 | Elec... | 4.50 | 4.50 | Evap. cond. | | | 4.62 | 34 |
| 35 | General offices | July | Unit | x | x | x | .... | x | 608 | 60.8 | ..... | 12,200 | Elec... | 1.50 | 1.50 | Air cooled | | | 2.00 | 35 |
| 36 | Residence | July | Unit | x | x | ..... | .... | x | ..... | ..... | ..... | ..... | Elec... | ..... | ..... | ..... | | | ..... | 36 |
| 37 | Residence | April | Central | ..... | ..... | x | .... | x | ..... | ..... | ..... | ..... | Elec... | ..... | ..... | ..... | | | ..... | 37 |
| 38 | Residence | April | Central | ..... | ..... | x | .... | x | ..... | ..... | ..... | ..... | Elec... | ..... | ..... | ..... | | | ..... | 38 |
| 39 | Residence | April | Central | ..... | ..... | x | .... | x | ..... | ..... | ..... | ..... | Elec... | ..... | ..... | ..... | | | ..... | 39 |
| 40 | Theater | July | Central | x | x | ..... | .... | x | 6,510 | 1,500 | 1,016 | 585,534 | Elec... | 45.00 | ..... | | x | | 48.00 | 40 |
| 41 | Private office | August | Unit | x | x | ..... | .... | x | 200 | 17 | ..... | 6,000 | Elec... | 0.50 | ..... | x | | | ..... | 41 |
| 42 | Residence | September | Central | x | x | ..... | .... | x | ..... | 99.0 | ..... | ..... | ..... | ..... | ..... | x | | | ..... | 42 |
| 43 | Drug store | October | Central | x | x | ..... | .... | x | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | | | ..... | 43 |
| 44 | Bar | October | Central | x | x | ..... | .... | x | 1,750 | 219.0 | ..... | 126,290 | ..... | 10.70 | 11.50 | | x | | 12.50 | 44 |
| 45 | Residence | October | Central | x | x | x | .... | x | 1,093 | 98.0 | ..... | 33,600 | ..... | 3.14 | ..... | Economizer | | | 3.29 | 45 |
| 46 | Office | April | Unit | x | x | ..... | .... | x | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | | | ..... | 46 |
| 47 | Theater | August | Central | ..... | ..... | ..... | .... | ..... | 9,300 | 3,000 | 1,224 | 762,610 | ..... | 67.50 | ..... | | x | | 80.00 | 47 |

# A MESSAGE TO FRIGIDAIRE DEALERS AND SALESMEN

A DEEP SENSE of appreciation prompts us to address this public message to the Frigidaire Selling Organization:

In 1936, you achieved the greatest sales success in the entire history of the refrigeration industry.

During the first six months, you sold more Frigidaires than during the entire year of 1935, or any other year.

And your rapid pace never slackened. Week after week, month after month, right through the year, you continued to pile up new selling records.

A few short months ago, we were proud that Frigidaire had sold one and one-quarter million more mechanical refrigerators than any other manufacturer. But now, because of your untiring efforts, Frigidaire can point with even greater pride to a margin of leadership of over one and one-half million refrigerators.

We helped you, of course. We gave you the Frigidaire with the Meter-Miser, a product conceived, designed and built with a single unwavering aim—to meet *all five* standards for refrigerator buying. We gave you carefully-prepared "Buy on Proof" selling plans, specially geared to the marketing problems of all three major selling seasons. We gave you the backing of dynamic, sales-compelling advertising.

But to all these ingredients of success you added one that was most important of all . . . one that is the essence of a winning campaign: Your Own Resourceful and Aggressive Activity.

Together, we have fulfilled the promise "You can do better with Frigidaire in 1936."

We are working now to make 1937 a greater year for Frigidaire Selling Men. Soon you will have new and more salable products, *featuring a revolutionary improvement that will be the talk of the industry and instantly capture the imagination of the buying public.* Backing up these amazing products will be a new, forceful sales and advertising program, to help you harvest, once again, an even larger volume of sales and earnings with Frigidaire.

Together, we have fulfilled the promise "You can do better with Frigidaire in 1936." The opportunity and the means are now at hand to fulfill another promise: "You will do *still better* with Frigidaire in 1937."

FRIGIDAIRE DIVISION
General Motors Sales Corporation
Dayton, Ohio

# News ABOUT PEOPLE

## F. W. Doolittle Relinquishes Duties as Utility Executive

Frederick W. Doolittle, who retired from executive work with the North American Company on December 1 (ELECTRIC WORLD, November 28, page 13), first became identified with

the North American System in 1916 as consulting engineer for its Wisconsin subsidiaries. Since 1923 he has been vice-president and a director of the North American Company and an officer and director of subsidiary and affiliated companies.

He was formerly a member of the engineering faculties of the Universities of Illinois, Colorado and Wisconsin. He assisted in the development of the technical work of the Public Utilities Commission of Wisconsin shortly after its organization and of the first public utility commission in the State of Illinois. From 1914 to 1916 he was the director of the Bureau of Fare Research of the American Electric Railway Association.

Mr. Doolittle is a member of engineering and scientific societies and is the author of a textbook "Cost of Urban Transportation Service" and of numerous technical articles. He will continue as a director of the North American Company.

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▶ PROF. WALTER J. SEELEY of Duke University was elected chairman of the North Carolina section of the American Institute of Electrical Engineers at the recent autumn meeting of this section in Charlotte. OTTO MEIER, Jr., also of Duke University, was named secretary- treasurer.

▶ JOHN BANKUS, for many years electrical engineer for Portland General Electric Company, Portland, Ore., has been appointed assistant chief engineer. Mr. Bankus has been with the company since 1921, holding the titles of assistant engineer and electrical engineer. Prior to that time and after his discharge from the army in 1918 he worked on construction for the Northwestern Electric Company for one year and for the Crown Willamette Paper Company for one year.

**IN NOAH'S ARK—Charles A. Collier, vice-president Georgia Power Company, proved himself as sharp a shooter with a pistol as he is with company sales problems on a recent fishing trip on the St. Johns River near Palatka, Fla., on the houseboat Noah's Ark**

## E. F. Jeffe Elected Edison Vice-President

E. F. Jeffe was elected last week a vice-president, sales department, of the New York Edison Company, Inc., according to an announcement by Frank W. Smith, president. Mr. Jeffe

was formerly assistant vice-president, sales department.

He joined the Brooklyn Edison Company as commercial engineer and assistant manager of the commercial engineering bureau, serving in that capacity until 1917.

Following military service he returned to the Brooklyn Edison Company, but resigned in 1923. The following year he managed the Brooklyn Industrial Exposition and served as sales manager of the Kenyon Rubber Company. In 1925 he engaged in engineering practice as president of E. F. Jeffe, Inc., continuing until he joined New York Edison in 1932.

•

▶ GEORGE H. JUMP, engineer at General Electric Company's Buffalo office, has been appointed New England district engineer for the company with

# *Kelvinator cuts the cost of better living*

The keynote of the Kelvinator program for 1937 will be—"Kelvinator Cuts the Cost of Better Living".

In a few short weeks you will learn about the program.

It will be welcomed by millions of families throughout America.

It will reach the people in your city, your town, your village.

It will herald a renaissance in the standards of American living.

It will make possible for the man of average income such luxury as has only been dreamed of by the millionaire.

It will present an opportunity to salesmen, specialty dealers, department and furniture stores, public utilities, such as has not been known before.

You will want to know about it.

You will want to be part of it.

KELVINATOR CORPORATION

*Detroit • Michigan*

headquarters in Boston. R. A. JONES of the G. E. Syracuse office goes to Buffalo as engineer and CARL E. H. VON SOTHEN, engineer of the Schenectady local office, has been transferred to Syracuse.

▶ E. L. FARQUHARSON, formerly head of the home laundry equipment division of the General Electric Supply Corporation, Boston, Mass., has been made sales manager of the division of that name for Landers, Frary & Clark, with headquarters at New Britain, Conn. He has been succeeded at Boston by Jerome Grannis.

▶ H. BENJAMIN SMITH has been appointed New England sales manager of the Colt's Patent Fire Arms Manufacturing Company, succeeding the late Daniel Fitts. Mr. Smith has been senior sales representative in the Boston office and will continue to make his headquarters in that city.

▶ C. R. PHENICIE, vice-president of the Wisconsin Public Service Corporation, has been elected a director of that utility and of the Menominee & Marinette Light & Traction Company to suceed R. J. Graf, Chicago, resigned. Mr. Phenicie has been associated with the utility in Green Bay, Wis., since 1911. He was appointed vice-president in 1916.

## P. S. Millar Elected Head of U. S. National Committee

At the annual meeting of the United States National Committee of the International Commission on Illumination, held in New York, November 13, P. S. Millar of the Electrical Testing

Laboratories, New York, was elected president and G. H. Stickney of the General Electric Company, Nela Park, Cleveland, Ohio, was elected secretary-treasurer.

An important subject of discussion was the proposed adjustment of the magnitude of the unit of candlepower on the part of all countries, including the United States, in the interest of a common universal unit for light of all colors. Because of the importance to all lighting interests of any such change no final action was taken and President Millar is appointing a representative committee to study the matter thoroughly and make recommendations.

The national committee reviewed the technical preparations for the plenary session, which is to be held in Holland in 1938.

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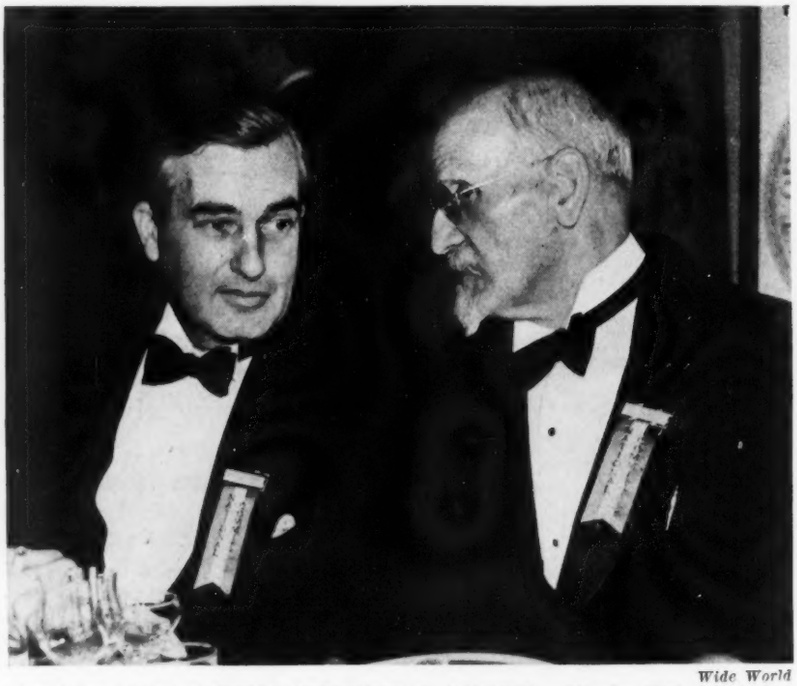
▶ PORTER DUNLAP, senior commissioner, was elected chairman of the Tennessee Railroad and Public Utilities Commission to succeed the late Gen. Harvey Hannah. LEON JOUROLMON, Jr., of Knoxville was administered the oath succeeding also General Hannah, to which vacancy he was appointed. He was elected a member of the commission at the November 3 election. Chairman Dunlap's tenure extends until January.

▶ JOHN M. DRABELLE was recently made president of the Iowa Coal Institute in recognition of his outstanding service on the board of directors and as chief engineer. Mr. Drabelle is mechanical and electrical engineer of the Iowa Electric Light & Power Company, Cedar Rapids, Iowa. More than twenty years ago Mr. Drabelle began studying Iowa coal and experimenting toward its efficient use in power production. This early work was one of the beginnings of the institute and from it has come an enlarged use of local fuel by Iowa industries and utilities. Mr. Drabelle succeeds in office the late Clarence Harper, who was president of the institute from its organization.

▶ E. F. PERKINS has severed a fifteen-year connection with the sales department of the Pacific Gas & Electric Company to become division sales manager of the Wesix Electric Heater Company at Los Angeles. He will direct the sales of the Los Angeles Wesix factory covering the territory of Southern California as well as New Mexico, Arizona and Texas. In 1925 he was placed in charge of electric appliance sales in the general office of P. G. and E., where he won an enviable reputation as a sales director in connection with seven annual electric range and water heater campaigns, each of which exceeded the



*Wide World*

**AT AMERICAN PATENT CENTENNIAL DINNER—Charles Edison (left), son of Thomas Alva Edison and Assistant Secretary of the Navy, and T. E. Robertson, formerly Commissioner of Patents, at the dinner held in Washington, D. C., honoring the history of invention in the nation**

# Burroughs

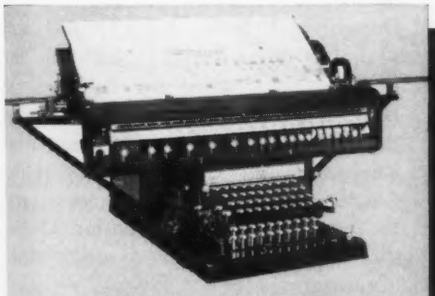
## PLAN YOUR PAYROLL ACCOUNTING NOW

*to obtain the information required by the*

## SOCIAL SECURITY ACT

Many employers are finding in recent Burroughs developments a simple solution to accounting problems set up by the Federal Social Security Act. Many have found that the exceptional speed, ease and economy of new Burroughs machines make it possible actually to lower accounting costs and still have the additional information required.

Investigate. Let a Burroughs representative assist you in meeting your payroll problems now, so that you will be prepared to furnish the information required by the Act when it becomes effective the first of the year.

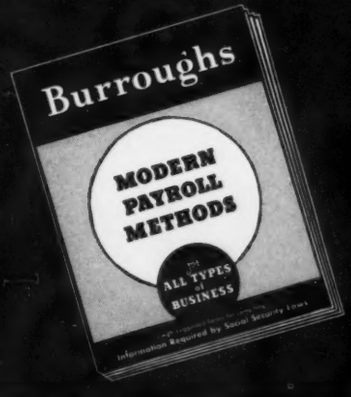


**BURROUGHS TYPEWRITER ACCOUNTING MACHINE**

Writes check (or pay envelope), earnings record, employee's statement and payroll summary in one operation. Column selection automatically controlled. All totals accumulated. Models to handle every accounting job.

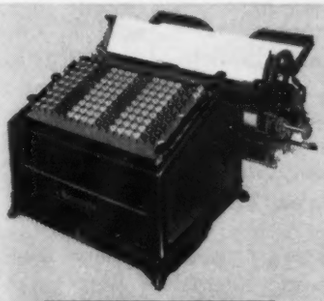
### THIS NEW FOLDER MAY HELP YOU

Burroughs has just produced an interesting descriptive folder illustrating complete payroll accounting methods, with typical forms for maintaining the information required by the Social Security Act. The forms show representative entries and suitable column headings. You may have this folder without charge simply by mailing the coupon.



**BURROUGHS DESK BOOKKEEPING MACHINE**

Posts earnings records, automatically prints dates in proper columns, automatically subtracts deductions—calculates net pay. Can also be used as a fast adding-subtracting machine for all kinds of accounting work. Low prices.



**BURROUGHS AUTOMATIC PAYROLL MACHINE**

Writes check (or pay envelope), employee's earnings statement, earnings record and payroll summary in one operation. Accumulates all necessary totals. Many models for payroll work as well as for other accounting jobs.

**BURROUGHS CHECK-WRITING TYPEWRITER**

Writes payroll checks in units or in strips. Payroll summary completed in same operation. Fast and easy insertion and removal of checks. Can also be used for correspondence and general typing. Electric carriage operation.

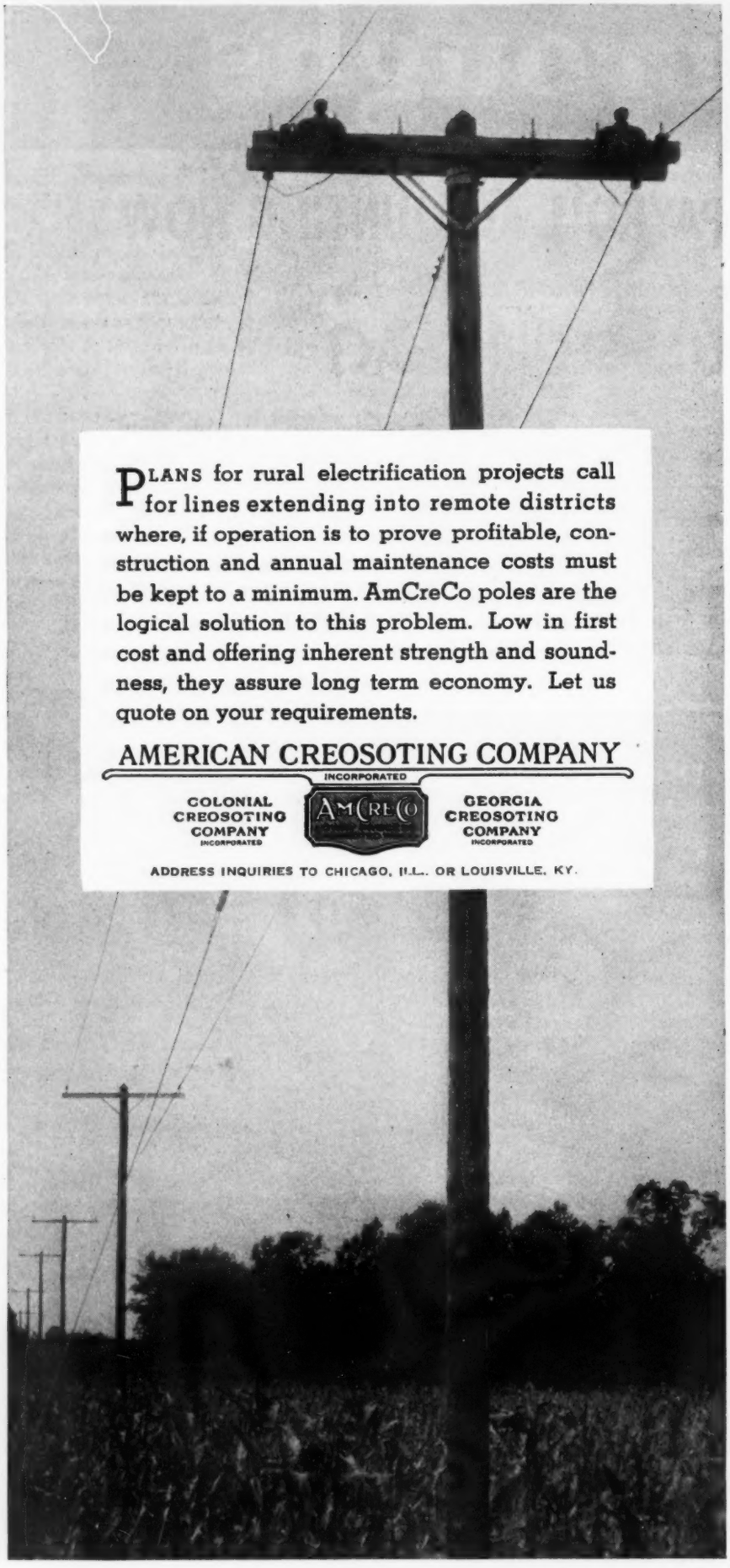
**MAIL THIS COUPON!**

BURROUGHS ADDING MACHINE COMPANY, 6932 Second Boulevard, Detroit, Michigan

Send me the new folder, "Modern Payroll Methods"—which includes illustrations of forms for compiling figures required by the Federal Social Security Act.

Name_____ Type of business_____

Address_____


PLANS for rural electrification projects call for lines extending into remote districts where, if operation is to prove profitable, construction and annual maintenance costs must be kept to a minimum. AmCreCo poles are the logical solution to this problem. Low in first cost and offering inherent strength and soundness, they assure long term economy. Let us quote on your requirements.
AMERICAN CREOSOTING COMPANY
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ADDRESS INQUIRIES TO CHICAGO, ILL., OR LOUISVILLE, KY.

quota set. He also was responsible for the development of the annual auxiliary electric heater campaigns which Pacific Gas conducts.

•

## OBITUARY

▶ GEN. ROBERT I. REES, assistant vice-president of the American Telephone & Telegraph Company, died November 23 in Harper Hospital, Detroit, of a cerebral embolism. He was 65 years old. General Rees was born in Houghton, Mich., and was graduated from the Michigan School of Mining and Technology. After attending Harvard University and the New York Law School for a year each he entered the United States Army in 1897. With a distinguished military career to his credit ,in 1924 he became assistant vice-president of A. T. & T. and in that capacity supervised the employment and training of college graduates for the company and supervised a program for insuring the employment and development of Bell System employees. He was to have retired on December 1 from A.T.&T. and was planning to join the staff of the Engineering Council for Professional Development. He was a member of the American Society of Mechanical Engineers, the American Association for the Advancement of Science and the Society for the Promotion of Engineering Education and many other organizations.

▶ H. S. COOPER, 80, utility officer and former secretary of the Southwestern Electrical and Gas Association, died in Dallas November 23. For some years Mr. Cooper had not been active except as he engaged in consulting work. He entered the utility industry in the late '80s. He spent several years with the Stone & Webster interests in Galveston, Tex., before he was appointed secretary of the Southwestern association in 1912.

▶ JOHN F. EGOLF, general manager of electric interurban lines in the Chicago metropolitan area since 1922 and long identified with electric utility history in the Great Lakes area, died suddenly November 22, at Aurora, Ill. His death was attributed to a heart attack. Born in Etna, Ohio, March 4, 1873, Mr. Egolf rose from a conductor on the Columbus, Ohio, street railways in 1902 to prominence in the electric utility and transportation

field. At the time of his death he was general manager of the Chicago, Aurora & Elgin Railway, president of the Fox Valley Bus Lines and vice-president of the Western United Gas & Electric Company.

▶ CHARLES V. WOODWARD, 57 years of age, manager of the Baltimore district of the Westinghouse Electric & Manufacturing Company, and a prominent electrical engineer, died at his home in Baltimore on November 19.

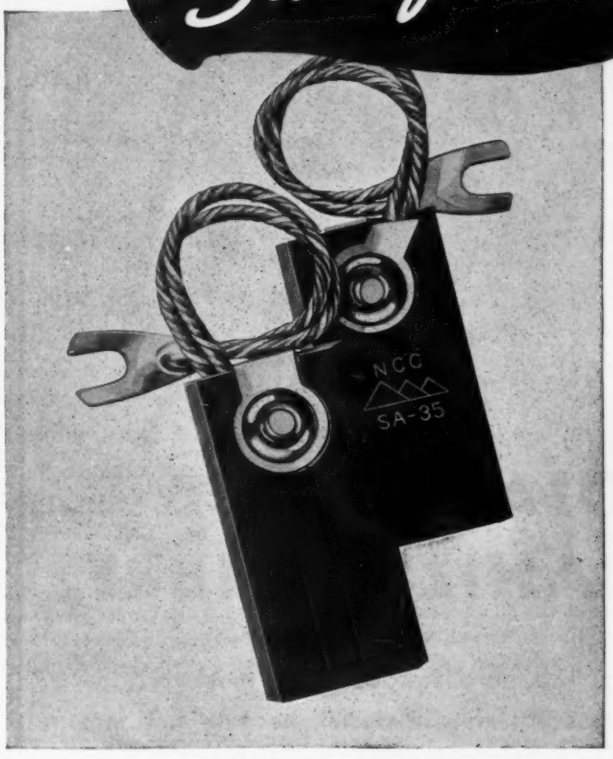
▶ ANDREW J. MCKENZIE, superintendent of the meter division of the Tennessee Electric Power Company, died suddenly October 28, of a heart attack, at his home in Chattanooga. He was 41 years of age.

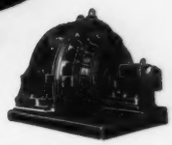
▶ BENJAMIN H. SCRANTON, chairman of the board of directors of the American Electrical Heater Company, manufacturer of electrical appliances, with headquarters in Detroit, died November 8, of a heart attack, at the home of his daughter in Scarsdale, N. Y. He was 80 years old. Mr. Scranton founded the American Heater Company in Detroit and was its president until 1920, when he became chairman of the board of directors.

▶ JAMES T. SKELLY, vice-president and director of the Hercules Powder Company, and a director of public utility companies, died October 31, following an illness of six weeks. He was 59 years old. At the time of his death Mr. Skelly was serving on the board of the Delaware Power & Light Company and the Delaware Electric Power Company. Besides his Hercules positions, he had extended and important commercial associations.

▶ DANIEL FITTS, New England sales manager of the Colt's Patent Fire Arms Manufacturing Company, Boston, for the past fourteen years, died in that city on November 9, following a short period in a local hospital. He was 59 years of age and in early life had been connected with the American Telephone & Telegraph Company in New York and with the electric traction industry. He became manager of the electrical division of the then Johns-Manville Company, Hartford, Conn., and thus was chosen New England sales manager for Colt's after the latter took over the Johns-Manville interests. Few men in the New England electrical field were more highly regarded.


THEY MUST GIVE *Satisfaction*





Blooming Mill Motors

Commutating Type, Polyphase A. C. Motors

Mine Hoist Motors

Mill Drive Generators

Elevator Traction Motors

Synchronous Rotary Converters

Turbo-Alternator Exciters

Electric Shovel Generators

★ Increasing application over a constantly broadening field is convincing evidence that a product is giving satisfaction. Sales of SA Series Grades continue their rapid growth. The range of service in which these grades have established superiority is steadily expanding. They DO give satisfaction.

★ SA Series Grades are the product of an exhaustive research program which determined and incorporated in this product the characteristics essential to satisfactory performance on commutating equipment. For this reason, they are uniform in *performance* as well as in *physical characteristics.*

*PROVE THEIR SUPERIORITY BY A TRIAL!*

NATIONAL CARBON COMPANY, INC.
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# GET THE FACTS!

*About . . .*

## DIAMOND VULCANIZED FIBRE

Diamond Vulcanized Fibre is probably the most versatile laminated fibrous insulating material, because it offers an unique combination of desirable properties. It is an extremely tough material which will stand any amount of abuse without serious damage, yet has good electrical insulating properties only slightly affected by moisture. It is readily fabricated by all common methods and is therefore an extremely economical material whether the need be for one part or a thousand parts.

The Diamond Vulcanized Fibre catalog illustrated above gives complete technical data, describes many of the countless uses of this versatile material, and tells how it is best and most easily fabricated. You should have a copy at your elbow for ready reference. Send for it today.

**CONTINENTAL - DIAMOND FIBRE COMPANY**

**NEWARK** **DELAWARE**


### Voltage Step-Boosted by Current Control

[*Continued from page* 32]

at around street-lighting time, boost throughout the peak-load period and then drop out shortly after midnight. This timing is exactly that which was hoped for.

Load readings taken at the booster installation showed that the load on the feeder increased approximately 6 per cent when the boosters picked up during the peak-load period. This is an added advantage of the boosters because on the particular feeder equipped an additional 25 kw. of load was carried over the peak-load period due to the increased voltage. Some of this load increase was undoubtedly lost due to higher losses, but certainly the net increase in load and the consequent revenue was appreciable.

### Rotary Currents Simplified in Four Novel Ways

[*Continued from page* 34]

reversals of power is shown in Fig. 4. The oil switch is used to sectionalize a long 66-kv. delta transmission line of high reactance, subject to frequent surges and 60-cycle power reversals. Each end of the line is a source of power. Formerly straight overcurrent protection was used for clearing faults on either side of the oil switch. Ordinary line faults were successfully cleared, but surges often caused faulty operations, since the overcurrent relays would continue to time on short reversals, so that correct operation in series time with the power directional relays in the next section of line was impossible. Installation of a second set of overcurrent relays and a three-phase double contact directional relay, as shown in the illustration, solved the problem.

•

### More Electric Trucks

Expanding industrial activity is indicated by the monthly statistics of the Bureau of the Census on shipments of electric industrial trucks and tractors, as reported by ten leading manufacturers. These numbered 124 in October, as against 112 in September, 117 a year ago and 45 two years ago.

The steadiness of the growth is shown by ten-month totals, which rose from 519 in 1934 to 705 in 1935 and 1,013 in 1936. Exports average about 7 per cent of the total.

# Here's that NEW

## NON-WATER ABSORPTIVE deproteinized rubber insulation for wires and cables

**Deproteinized rubber imparts added life and stability to cables exposed to moisture.**

**Makes lead sheaths unnecessary on underground and submarine power and communication cables.**

Simplex Wire & Cable Co.
79 Sidney St., Cambridge A, Boston, Mass.

*Please send booklet, data sheet and technical paper on Simplex-Anhydrex AA to:*

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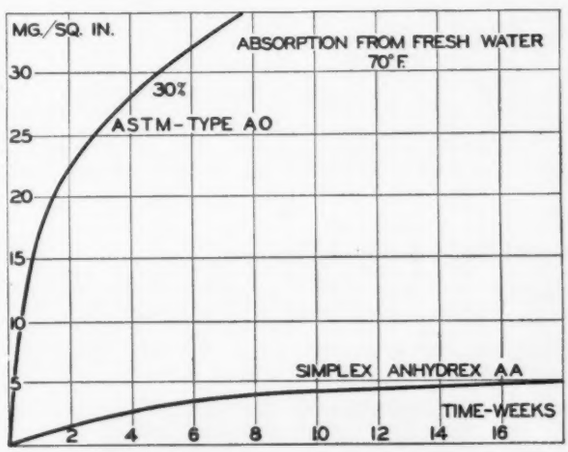
*Let us send descriptive booklet, data sheet and technical paper covering uses and applications of Simplex-ANHYDREX A A deproteinized rubber insulation. Please use this coupon.*

Rubber contains proteins which absorb moisture. Research in Simplex-Laboratories revealed the cause and cure of water absorption and led to the development of Simplex-ANHYDREX AA deproteinized rubber insulation. Deproteinization makes rubber non-water absorptive and removes the cause of most cable failures but the electrical and physical properties, which make it the best insulation for wires and cables, remain unchanged.




Simplex-ANHYDREX AA is the only insulation made with deproteinized rubber. It is exclusively a Simplex product. (Patent No. 1997355.) It does not absorb water and shows no deterioration after prolonged submersion. On submarine cables installed in hot tropical waters there is no change in electrical properties after years of service.

Its low capacity and low power factor make it the ideal insulation for communication cables. Because of its electrical stability and long life it also is unexcelled for underground power cables which operate at higher temperatures and raise the temperature of their surroundings. Warm, fresh water in conduits or moist earth is more of a menace to conventional rubber insulation than the cold, salt water of most submarine installations.

Lead sheaths are unnecessary with Simplex-ANHYDREX AA insulation. Omission of the lead sheath makes a lighter cable and assures freedom from electrolysis, corrosion and other sheath troubles. Tests which demonstrate electrical and physical stability, as well as non-water absorption properties, prove conclusively that Simplex-ANHYDREX AA is the best insulation for power and communication cables, underground or submarine, under all conditions. Complete information in descriptive booklets, technical papers and data sheets will be sent upon request. Please use the coupon.

**Simplex Wire & Cable Co., Sidney St., Cambridge A, Boston, Mass.**

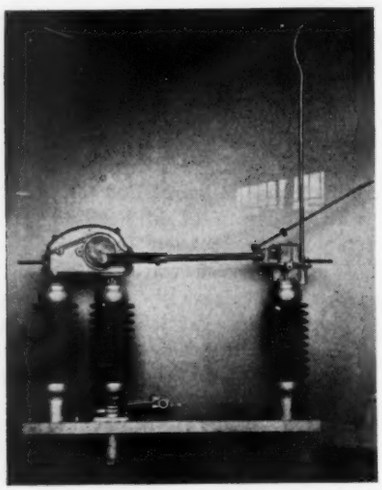
# Simplex-ANHYDREX AA

**deproteinized rubber insulation for wires and cables**

# New EQUIPMENT AVAILABLE

## Outdoor Switch

Motion of the switch arm of this new outdoor switch is controlled by the entirely inclosed bronze mechanism which is operated by the rotating insulator. Arm is first moved endways out of the self-aligning contacts under the sleet hood, then swung to the open position. This end movement and the raising or lowering of the switch arm are controlled by two rotating parts—



Rated at 600 amp., 34.5 kv.; provides open gap of 22 in. between live parts; over-all length, 44 in.; Lapp "Station-Post" insulators. **Hi-Voltage Equipment Co.,** Cleveland, Ohio.

the shaft to which the arm is keyed and the disk in which the shaft is journaled. Rotation of the disk moves the blade endways; rotation of the shaft swings the blade open or closed.

•

## Welding Electrode

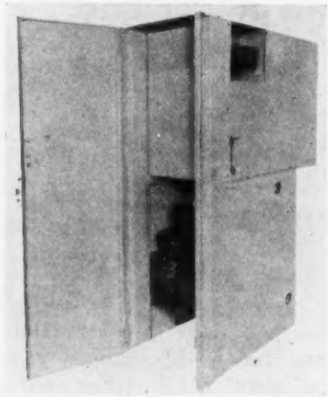
"Chromeweld 4-6." **Lincoln Electric Co.,** Cleveland, Ohio.

Steels known as 4-6 per cent chromium steels—increasing in acceptance in applications requiring resistance to crude oil corrosion at high temperatures and pressures—can be successfully welded by the use of this new electrode, it is claimed. Such steels, when welded with the electrode, can be soft annealed to physical properties said to be similar to those of mild carbon steel, and therefore rendered suitable for equipment where severe cold working is applied during fabrication.

•

## Industrial Type Switchgear

New three-phase metal-clad switchgear units can be mounted in banks of two or more units in one location or in different parts of a plant. All live parts are steel inclosed and the various elements, such as oil circuit breaker, buses, metering transformers, etc., are in separate internal com-



Type RA; dimensions, 20 x 45 x 60-72 in.; self-contained; 5-kv., 600-amp. and 25,000- and 50,000-kva. oil-blast circuit breakers interchangeable between units of same rating. **Delta-Star Electric Co.,** Chicago, Ill.

partments with steel barriers between units. Breakers are inserted or removed by a small truck; a positive interlock is designed to prevent the breaker from being raised to or lowered from the operating position except when fully opened.

•

## Life Line Adjuster

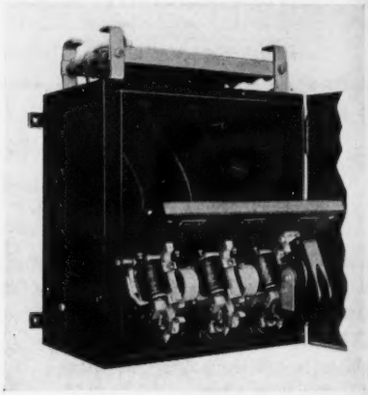
An automatic life line grab—a one-piece, non-ferrous, non-corrosive fitting—has been announced that is said to make practical the use of an independent life line. The life line is threaded through the adjuster,

"Allsafe;" recommended for use with ⅝- and ¾-in. long fiber manila rope; tensile strength, 65,000 lb. per sq.in. **American All-safe Co.,** Buffalo, N. Y.

which in turn is attached to the "D" ring of the safety belt by a drop-forged link. As the workman moves about the line travels freely through the grab. Should he start to fall, however, the grab trips up and locks the life line in its tapered grooves, stopping the fall in a short distance.

## D.C. Mill Type Starter

Recently announced direct-current mill type starters are said to provide a universal, compact, standardized unit suitable for use with a wide range of motor sizes and requiring only reconnection of the self-contained resistors to give proper resistor values. Mer-



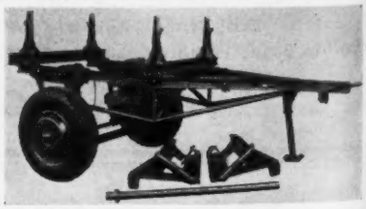
Type RD; can be used with any motor within range of 5 to 25 hp., 230 volts; also suitable for use with a range of horsepower sizes on 115- and 550-volt motors within ampere rating of contactor. **Electric Controller & Manufacturing Co.,** Cleveland, Ohio.

cury acceleration relays, employed in these starters, permit a time range of ½ second to 2 seconds per step. Starter can be arranged to provide low-voltage release or low-voltage protection and is operated by means of a separately mounted push button, pressure switch, altitude regulator or similar device.

•

## Pole and Cable Reel Trailer

A new trailer has been developed especially for companies having a limited need for a standard cable reel unit. Bolsters with sliding cam-locking stanchions are quickly mounted or unmounted as required. Cable reel saddles can be attached quickly

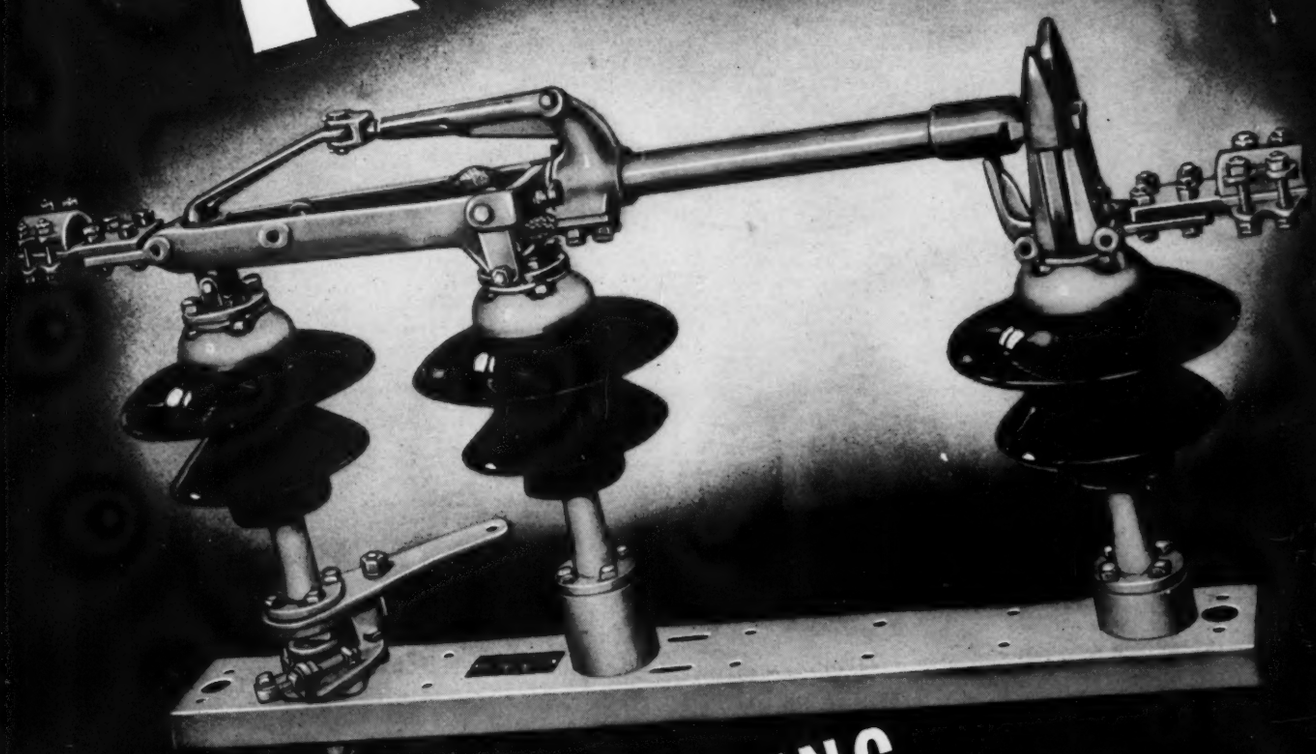


Two types, PCP and PCP-2, for reels up to 48 in. wide and 84 in. in diameter; pneumatic or other tires, electric or vacuum brakes. **Highway Trailer Co.,** Edgerton, Wis.

and securely, affording the same effective means of loading and transporting cable as in the standard cable reel trailers, it is claimed.

A clean contact with each operation of

# R&IE



## SWITCHING EQUIPMENT

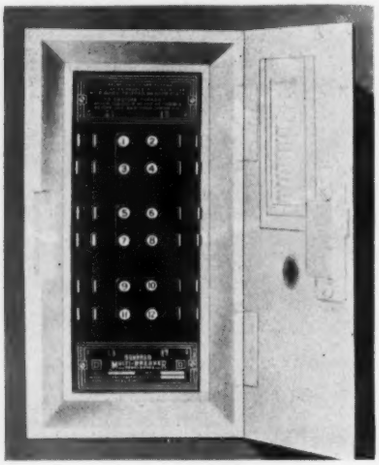
Each operation as easy and effective as the last

RAILWAY AND INDUSTRIAL ENGINEERING CO.

GREENSBURG, PENNA.

## Lighting Panelboards

Panelboards incorporating this company's recently announced "Multi-breaker" units are now available. Boxes are compact and small, permitting their installation in spaces too small for mounting other panelboards, the company states. Boxes are galvanized,



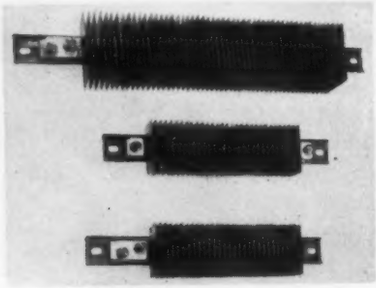
Supplied with from 4 to 40 circuits in two-circuit groupings for 115, 115/230-volt, a.c. service. **Square D Co.**, Detroit, Mich.

with knockouts in the top and bottom. Wiring gutters are 4 in. wide. Mains can be arranged for either single-phase, three-wire solid neutral or three-phase, four-wire systems; single-pole (two-wire, solid neutral) branches are obtainable for 15, 20, 25 or 50 amp.

•

## Vane Type Heaters

Metal vanes, each securely welded to the flat tubular sheath of strip heaters, assure a high rate of conduction of heat from the unit to the vanes and, consequently, rapid convection of heat from the vanes, say the manufacturers of this electric heating unit strip. Size of the vanes varies with type



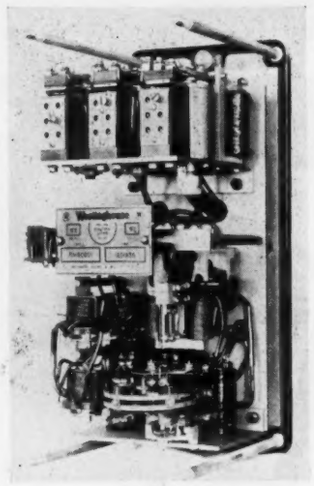
Available in variations of wattage and voltage to suit requirements and with various terminal arrangements. **Harold E. Trent Co.**, Philadelphia, Pa.

and size of inclosure and depends on whether free or compressed air is the medium heated. Casings are steel, although alloys of steel or copper can be supplied, and the heaters may be secured in eight standard lengths, or incorporated as complete unit heaters, with fans and thermostat to form a complete installation.

•

## Reactance Relay

To raise stability limits, minimize line damage and safeguard apparatus on high-voltage transmission systems, a reactance relay has been developed for high-speed protection against faults. They are said to work equally well on single lines, closed



Type HX. **Westinghouse Electric & Manufacturing Co.**, East Pittsburgh, Pa.

loops or parallel lines, to operate with a minimum of time delay and to assure accurate distance measuring for these faults. Three distance elements, one directional element and a synchronous timer are connected to give zone-type time-distance characteristics.

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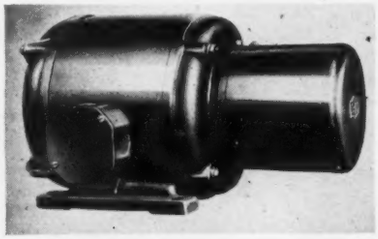
## Motor-Mounted Brake

A totally inclosed, automatic solenoid brake integral with the motor has been announced that is said to be especially suitable for laundry, textile and woodworking machinery, for hoists, elevators, machine



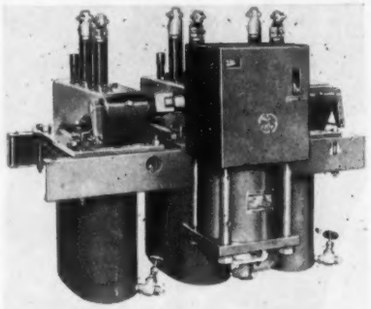
For motors from fractional to 10 hp., at 3,600 r.p.m., a.c. or d.c.; available with dust-tight, weatherproof and water-tight inclosures. **Cutler-Hammer, Inc.**, Milwaukee, Wis.

tools, job presses and the like. Rotating member consists of a single, heavy, molded disk that is said to show little wear on exhaustive tests even on maximum horsepower. It can be supplied already mounted on any suitable motor from the motor manufacturer.

•

## Oil Circuit Breakers

To supply a demand for circuit breakers for interrupting duties of from 100,000 kva. to 250,000 kva. at 15 kv., with a separate tank for each phase, new oil-blast circuit breakers are available, in three types. One type has silver-to-silver line pressure type main contacts, butt type copper arcing contacts; the two others have main contacts of the wedge and finger type. Breakers can be furnished for mounting on fabricated steel framework or in steel or masonry cells, and with trip-free electrically or manually operated mechanisms.



Type FK-158, 15 kv., 600 amp.; available in one-, two-, three- and four-pole units. **General Electric Co.**, Schenectady, N. Y.

## ENGINEERING DATA FROM MANUFACTURERS

**Bulletins and catalogs now available to engineers by manufacturers and associations**

STAINLESS STEEL TUBING—"Helpful Data on the Properties and Use of Carpenter Stainless Welded Tubing," issued by the Welded Alloy Tube Division, Carpenter Steel Company, 347 Madison Avenue, New York, contains information on the forms and mechanical properties, together with working instructions and a table of weights of this stainless steel tubing.

SWITCHES AND FUSE MOUNTING—The Delta-Star Electric Company, 2400 Block, Fulton Street, Chicago, Ill., has issued a 48-page bulletin No. 32–C, describing a complete line of outdoor disconnecting switches, fuse mountings, and combination units in voltages up to 161 kv. Complete dimensions, ordering data, insulator flashovers and cantilever strengths are given. The fuse section includes recommendations for transformer protection and charts for determining blowing time of fuses for determining short-circuit values.

FLOODLIGHTING—Bulletin GEA–1865 of the General Electric Company, Schenectady, N.Y., is devoted to a discussion of incandescent floodlighting equipment. Pictured are various applications, with recommendations for sports lighting, tables for solving floodlighting problems. Individual floodlighting projectors of various types are shown; their dimensions, ratings and construction details are included. Mercury-incandescent floodlights, designed especially for filling stations, are discussed in bulletin GEA–2358.

DIESEL ENGINES—Operation and construction of two-cycle Diesel engines for heavy-duty stationary service are described in bulletin 3200-E3 of Fairbanks, Morse & Company, 900 South Wabash Avenue, Chicago, Ill. Drawings and sectional views help to make clear the working features and the functions of the various parts. Typical installations are pictured and specifications are furnished in the 28-page publication.

AIR CONDITIONING PROGRESS—"Progress in Air Conditioning in the Last Quarter Century" is the title of a paper by W. H. Carrier, presented at the semi-annual meeting of the American Society of Heating and Ventilating Engineers held in June, 1936, and reprinted from the A.S.H.V.E. Journal Section of *Heating, Piping and Air Conditioning*. Developments and improvements in this field are discussed and pictured in the reprint.

INDUSTRIAL DEVICES—Industrial devices, including stroboscopes, color comparators and "Variac" transformers are included in catalog J of the General Radio Company, Cambridge, Mass. Other devices listed in the well-illustrated 172-page booklet are vacuum-tube and copper oxide voltmeters for measuring a.c. voltage and power output, frequency- and time-measuring devices and oscillographs.

# 600 FEET FROM SUNLIGHT

To insure uninterrupted production as well as maximum safety, mine operators depend on SYNTHANE laminated bakelite for insulating mining machinery.

SYNTHANE—the dependable insulation that protects equipment in the air, on the ground, under the ground, on and under water—adds to your products the same degree of reliability.

SYNTHANE LAMINATED BAKELITE
SHEETS • RODS • TUBES
FABRICATED PARTS

*Send for Sample Book*

SYNTHANE
CORPORATION OAKS · PENNA

# Manufacturing AND MARKETS

## Numerous Innovations Distinguish Exhibits at New York Power Show

Many items not yet announced in literature were prominent features of the exhibits at the Power Show last week in New York timed with the A.S.M.E. annual meeting. Enhanced number and scope of displays give the show its old-time flavor and snap.

Bull Dog Electric Products had a new vacuum break plug for its Distribution system, Benjamin Electric a new skylight unit and American Car & Foundry a horizontal heater for spot and spot tempering with automatic setting of temperature and duration. Bailey Meter shows a redesigned draft gage with translucent Plaskon scale and new diaphragm unit with the same unit interchangeable between pressure, draft and differential functions. Fairbanks exhibited brass and iron body valves with renewable gates. Hays Corporation's Orsatometer is a new gas test apparatus that is portable and goes for 1,000 analyses without recharge; it is incorporated into the still newer portable $CO_2$ recorder.

Potentiometers control has been redesigned by Foxboro and simplified adjustments worked in. Weston Electrical Instrument exhibits a new microammeter and photocell filter that has a replica of the eye's curve; the industrial control relay has been speeded up substantially. New Departure displayed a full range of transitorque motor units for wide speed range. New at the General Electric booth were an Alnico breaker and a Tungar arc welder. Brown Instrument featured a Diesel pyrometer with twelve exhaust positions and a Protectoglo which keeps gas flames going by means of electron-through-the-flame actuation of ignition.

### *What's new at the Power Show*

Leeds & Northrup displayed a new fluid flow recorder featuring high accuracy and a wet-gas cell $CO_2$ recorder operating on the same thermal conductivity principle as its older instruments but using saturated rather than dry gas. Cornell Dubillier showed a new compact capacitor unit for industrial power-factor correction. Bristol displayed a new power frequency recorder said to be accurate to 1/100 of a cycle regardless of wave form, voltage or power factor.

Notable in the Cutler Hammer exhibit was the trend toward compactness and attractiveness of the line of motor control stations which now embrace start, stop and protect functions in less space and trimmer environment than the predecessor start-stop button boxes.

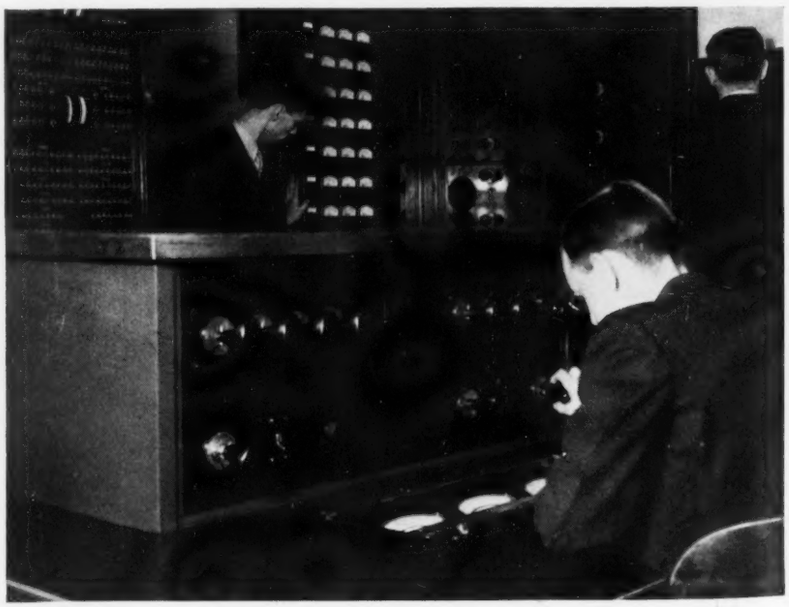
•

## Calculator Busy on Power Problems

With increasing loads pointing toward the capacity of equipment, many power companies find it necessary to solve quickly new generation and distribution problems. Five companies wishing to determine accurately the added power needed and the load limits and stability of their systems have recently engaged the Westinghouse a.c. calculating board to analyze their problems, it is reported.

During the past year eighteen major system studies involving plants up to 500,000 kva. capacity have been completed on this efficient board. These systems included eight utilities, six government projects, two industrial plants and two foreign power systems.

This is probably one of the largest a.c. calculating boards built to date and with its 300 circuits it can readily duplicate by miniature replica any power system in this country. With its aid, system stability, power-factor correction, load-voltage regulation studies and the best location for new generating, transformer and line equipment are readily determined. Through the



**MULTUM IN PARVO—Westinghouse technicians set their 300-circuit board and solve public utility problems involving capacity, location of generators, transformers, added lines, protective equipment**

accurate and comprehensive analysis made possible by these facilities users are able to curtail investment in standby equipment and determine a definite program of future expansion in a minimum time and at a minimum expense, all with definite assurance of sufficient margins at all times to meet forecast emergency conditions.

•

## Transformers Ordered From Westinghouse

Westinghouse Electric & Manufacturing Company has received two orders for transformers totaling approximately $800,000. The United States Reclamation Service requisitioned four transformers for use at Boulder Dam, and four transformers have been ordered by the Consolidated Gas, Electric Light & Power Company of Baltimore for use in the new electrified mill of the Bethlehem Steel Company at Sparrows Point, Md.

At the meeting of its board of directors last week the Westinghouse Electric & Manufacturing Company issued the following statement:

"The board of directors of this company today declared a dividend of $2 per share on the preferred stock and on the common stock of the company, such dividends to be payable December 21, 1936, to stockholders of record at the close of business on December 7, 1936.

"At the same time the board of directors authorized a special payment to employees computed on the basis of $1 for each year of service with the company plus $5."

•

## Penn Electric Switch to Build $225,000 Plant

Penn Electric Switch Company, Thomas Street, Des Moines, Iowa, manufacturer of switches, controllers and allied electrical equipment, has awarded a general contract to Austin Company, Cleveland, Ohio, for a new two-story plant at Goshen, Ind., totaling over 85,000 sq. ft. of floor space. Cost to be about $25,000.

**New York Metal Prices**

| | Nov. 24, 1936 Cents per Pound | Dec. 2, 1936 Cents per Pound |
|---|---|---|
| Copper electrolytic | 10.50* | 10.50* |
| Lead Am. S. & R. price | 5.20 | 5.20 |
| Antimony | 12.25 | 12.375 |
| Nickel ingot | 35.00 | 35.000 |
| Zinc spot | 5.425 | 5.425 |
| Tin Straits | 51.00 | 51.375 |
| Aluminum, 99 per cent | 19—21 | 19—21 |

* Delivered Connecticut Valley.

# Field Reports on Business

*Reports made to the* ELECTRICAL WORLD *from the field show that most lines of business continue to gain, with indications of no let-up during the balance of the year. The tremendous spurt in consumer spending which has developed since the election has led merchants to hope for a holiday sales volume equal to the 1930 level.*

### NEW ENGLAND

Considerable activity is noted among engineers and representatives of prominent manufacturers in this district in connection with the preparation of estimates of cost for heavy electrical machinery. Small motor sales continue to dominate power equipment orders; one well-known sales manager estimates that small motor sales for 1936 in this area will show about 30 per cent increase over the volume reported for last year. Orders for several 15-hp. and a number of 8½-hp. motors (all group drives) were recently received by one manufacturer; fractional-horsepower motor sales are reaching a peak for manufacturers in this district, according to one source, with lot orders of 100 and 150 motors being received periodically.

Line materials for outlying rural service have eased off during the past fortnight, but purchases of poles, wire and line hardware are being considered for a western Massachusetts airport and interest in airport improvements and expansion is becoming more active in Rhode Island. Arc-welding units are attracting much interest; one manufacturer reports a large volume of inquiries on hand and the likelihood of sales soon of several 150-amp. machines. Providence, R. I., has purchased a year's supply of incandescent lamps from the Providence Electric Company at a cost of about $1,900. The Westinghouse Electric Elevator Company recently sold one freight and four passenger elevators for the new building for the New England Power Association to be erected at Dartmouth and Stuart Streets, Boston.

A 35-hp. air-conditioning equipment was sold for installation in Corey Hill Hospital, Brookline, Mass., the first all air-conditioned hospital in the United States.

### CHICAGO

Forming a line very similar to that which pictured an ever-rising volume through November and December, 1935, business last week climbed to a new high since 1930. The railroads gave definite evidence that they are swinging into stride with other business by releasing orders for equipment and materials on an impressive scale. The large number of orders for Diesel-electric engines is keeping the Electro-Motive plant in Chicago working at capacity.

Holiday buying measured up to expectations and is bearing out the earlier prospect of the heaviest retail trade since 1929. Chicago stores have hired between 25,000 and 30,000 additional employees for the season. More wage increases and bonuses were announced by electrical companies, adding to the long list which had previously taken such action.

Two manufacturers of electrical equipment will immediately start erecting new plants, while two more are building additions to existing srtuctures. Construction activity was given further impetus by the announcement of several large store modernizations and a huge residential building project scheduled to start immediately.

Two wire and cable manufacturers report last month as the largest in their history. Reports from power companies show heavier buying. Quotations are being asked for 18,000 ft. 600-volt rubber-insulated, lead-sheathed cable and a 3-ton electric hoist.

### NEW YORK

Outlook for the steel industry continues exceptionally good, especially for the balance of the year, as a result of the higher prices announced. Steel rail and accessory buying by carriers was 150 per cent higher in three months ended November 30 than in similar months of 1935. Output of automobiles last week was estimated at 104,283 cars and trucks. This figure compares with 93,995 in the 1935 week.

Class 1 railroads of the United States earned net operating income of approximately $90,000,000 in the month of October, according to estimates based on reports of individual railroad released to date. Production of electricity by the electric light and power industry for the week ended November 28 was 2,133,511,000 kw.-hr., an increase of 13.7 per cent over the similar week of 1935.

### PACIFIC COAST

The maritime union strike enters its second month with its paramount issue, the hiring-hall, still deadlocked, with frantic radical efforts to embroil the wholesalers' warehousemen of all coast cities and with a perceptible retail business drop due to uncertainty over its duration. Wholesale business also decreased about 20 per cent below October, though attempts to build up contractors' and utility reserve stocks helped considerably.

Westinghouse records a low bid of $949,000 for certain gates and conduit linings for Grand Coulee Dam in Columbia Basin project, Washington. Railroads report considerable air conditioning in San Francisco yard and completion of certain units of Los Angeles Union Depot. Building of a $7,000,000 job will hold over until next year. Work is just beginning on Pioche plant of Boulder Dam project. Government purchasing is heavy and varied, including such items as 1,000 radio headsets, 4,000 cords and bands and 1,000 miles of iron wire for forest service.

Electrical machinery orders include eight transformers of sizes 1,000 and 1,667 kva., value $48,210; a 1,200-kva. furnace transformer, value $10,000, to a smelting company and a 515-hp. mechanical drive turbine, value $3,500, to a sugar plant.

Residential and light industrial work predominates, reflected in manufacturers' exhaustion of sizes one-half to one-inch fittings. Wholesalers' inventories will probably be high this year through storage of material already sold to contractors for large jobs delayed because of structural steel shortage owing to strike.

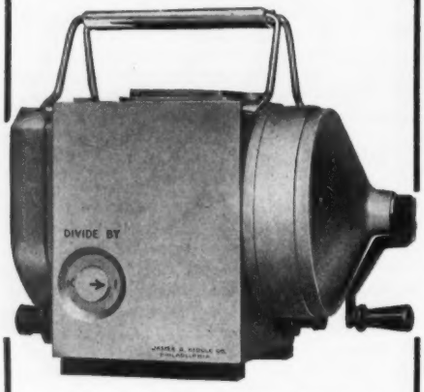
*How*

**"MEGGER"**

TRADE MARK REGISTERED U. S. PAT. OFF.

**INSURANCE**

*Saved "at least $600" in a Cement Mill—*




"Super-Meg" Insulation Tester

THIS company has installed horsepower of about 7600. They use a "Megger" instrument for testing insulation in high tension transformers, feeders, starters, motors, etc.

Lines and starters are now tested regularly once a month, and *in the first 15 months* the instrument actually saved, in the words of the purchasing agent, "at least $600." In addition, an underground feeder was tested and trouble corrected just in time to prevent shorting. No estimate was made of the time saved and damage prevented in this particular instance.

And so it goes, wherever "Megger" Insurance is intelligently applied. Damage prevented! Money saved!

*Write for Bulletin 1445-W*

**"A Stitch in Time"**

*you will find it interesting.*

**JAMES G. BIDDLE CO.**

ELECTRICAL INSTRUMENTS

1211-13 ARCH STREET PHILADELPHIA, PA.

## Appliance Sales Keyed to Market Analysis

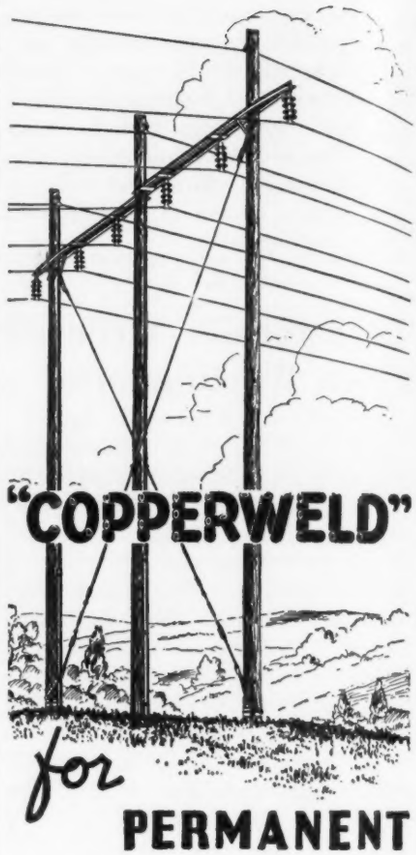
[*Continued from page 44*]

lished by the U. S. Department of Commerce. Local, municipal and private agencies have made similar inventories of other cities.

The first step in making a market survey is a search for available market data and tried methods of presentation. As the field of marketing research is relatively new, it may require some selling to the executives to sponsor such studies. Perhaps the best approach to selling the idea of marketing research is contained in a one-act play, "The Sales Manager Proposes," a pamphlet by George W. Kelsey. This idea may seem novel to engineers, but it should be added that Mr. Kelsey is a well-known member of the A.S.M.E. As a start, another pamphlet by Mr. Kelsey is recommended, published by the A.S.M.E., "A Selection of Books and Articles on the Purpose, Scope and Techniques of Marketing Research." This gives a fine bibliography of the subject.

The U. S. Department of Commerce has much available data with which business men should become more familiar. Of primary interest to marketing students is the tri-monthly publication *Domestic Commerce*, which gives the latest current developments in this field. A special analysis of the 64 cities covered by the Real Property Inventory has been made, called "Markets for Electrical and Gas Facilities in Residences," which is available from the Department. This study is not only valuable for the cities covered, but, owing to their selection, general conclusions may be drawn that will be applicable to other cities. Another most important guide to the general field of study is "Market Research Sources, 1936," published by the department. A list of government publications of interest to market students follows:

1. Market Data Handbook of the United States, 1929.
2. General Consumer Market Statistics, Supplement No. 1.
3. Consumer Market Data Handbook, 1936.
4. Manufacturing Market Statistics, 1932.
5. Statistical Abstract of the United States.
6. Wholesale Distribution — Census of American Business, 1933.
7. Retail Distribution — Census of American Business, 1933.
8. Fifteenth Census of United States — Population, 1930.
9. Consumer Use of Selected Goods and Services by Income Classes — Nine cities covered.



**"COPPERWELD"**

*for*

**PERMANENT STRENGTH**

Copperweld Overhead Ground Wires have the high tensile strength and mechanical stability required for such installations. They can be pulled up tightly, with safety, to provide maximum clearance above conductors at midspan. They are able to withstand heavy ice and wind loadings without being overstressed.

Copperweld Ground Rods and Clamps provide the dependable grounds required with overhead ground wires. They do not depreciate with time.

**COPPERWELD STEEL COMPANY**

GLASSPORT . . . . PA.

## Highway Lighting Moves to Higher Intensities

[*Continued from page* 47]

installed. The sodium lighting on the Schenectady-Duanesburg highway will be the longest single strip of sodium lighting in the world. With 25 sodium lamps per mile the highway will be lighted at an intensity of approximately 45 lumens per linear foot, which is higher than anything heretofore attempted for such a length of road. The sodium lighting for the Albany-Schenectady road provides approximately 85 lumens per linear foot of highway, which is more than the minimum requirement of the I.E.S. code for medium traffic thoroughfares within cities.

### *Comparative studies afforded*

Use of the Reid unit on the Ballston road will provide a direct comparison between the two most modern types of highway lighting at their best. The Reid luminaire is of Alzac aluminum, shaped as a truncated cone, and distributes light from 4,000-lumen lamps so as to provide uniform brightness between luminaires. This equipment will give an intensity of 32 lumens per linear foot, which, with the greater brightness of incandescent lighting, is expected to compare favorably with the sodium installation of 45 lumens per linear foot. This system of highway lighting will be the most marked advance in highway illumination so far and will provide uniform and adequate intensity so far unused on highways.

In addition to highway lighting, the city of Schenectady and village of Scotia have just installed sodium-vapor lights on the Great Western Gateway Bridge, which runs between the city of Schenectady and the village of Scotia (see headpiece). This bridge is about three-quarters of a mile in length and is one of the few bridges which have been built on the arc of a curve. On this bridge 166 lumens per linear foot are provided, making this one of the best-lighted bridges in the United States. The effect of this sodium lighting on accidents will be of great interest.

All of this installation is being made and owned by the New York Power & Light Corporation, the municipality being billed each month for the service rendered under a "three-part" contract.

CORE AND COIL ASSEMBLIES OF WAGNER TRANSFORMERS
Photo F1430 — Typical type HE single-phase transformer element representative of 1.5 to 5 kva., 6900 to 8300-volt ratings.
Photo F1528 — Typical core-type element representative of voltage ratings 16501 to 33000 — standard ratings up to 200 kva. Element shown is a 10 kva., 33000-volt unit.
Photo F1409 — Typical three-phase transformer element. 50 kva., 2300/4000Y to 115/230 volt element shown.
Photo F1278 — Typical shell-type single-phase distribution transformer, representing ratings of 15 to 200 kva. in voltages up to and including 5000 volts. 100 kva. unit shown.
Photo F1411 — Typical shell-type single-phase element, representative of ratings from 250 to 800 kva.

For Wagner transformers from the smallest to the largest, a wide diversity of magnetic structures and methods of assembling them exist. The choice of the type of construction is determined by the various mechanical and electrical factors, the importance of which vary with the rating and dimensions of the transformer, such factors as reliability of insulation, mechanical strength, compactness, relation between width, length and height of each unit, etc. Bulletin 180, which completely describes the construction details, will be sent upon request.

TD336-5B

**Wagner Electric Corporation**

**6400 Plymouth Avenue, Saint Louis, U.S.A.**

TRANSFORMERS MOTORS FANS BRAKES

WIRES *Can't* SLIP IN THE

# FARGO LINE SPLICE

"The *Sure* SPLICE"

WITH THE NEW "SAFETY ZONE"

The Fargo "Safety Zone" holds wire ends clear of jaws. Even burred-end wires cannot slip! Easy to handle, saves time. Everdur serrated jaws. Phosphor Bronze Spring. Corrosion resisting hard copper shell . . . high in conductivity.

Write to Line Material Co., South Milwaukee, Wisconsin, for full information.

*Mfd. by Fargo Manufacturing Co.*

DISTRIBUTED BY

LINE MATERIAL CO.

## Welder Energy Supply a Service Problem

[*Continued from page* 45]

able voltage drop through the transformer and the allowable voltage drop at the welder, one is able to advise as to the special transformer capacity required to serve the load. We have found that it is not necessary to supply transformer capacity equal to that of the welder transformer. In general, a special transformer 75 per cent of the capacity of the welder transformer will be satisfactory. The heating effect is small because of the intermittent nature of the load and it is only necessary to provide sufficient capacity to maintain proper voltage conditions at the weld.

A few manufacturers and distributors of this type of welding equipment have come to us for information as to what would be necessary to serve such a load before selling their product and have saved themselves and us considerable embarrassment and trouble. Our usual procedure is to make a load test on their equipment, furnish them with a copy of the test and, if the load is small—say up to 3 or 4 kw., advise them that in some locations it could be used on the secondary distribution, but in most locations a special transformer would be required, and suggest that they contact us before selling the welder so that they can determine definitely and advise the prospect as to the requirements for a particular location. Table II shows some characteristic tests on these welders.

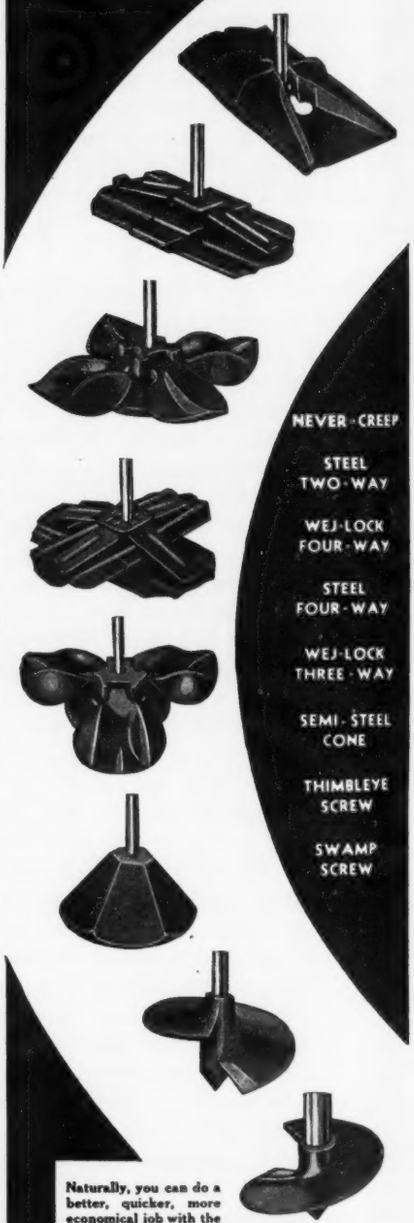
In a very few cases where the welder load forms only a small portion of the customer's instantaneous demand, and therefore does not add to the transformer capacity necessary to serve the customer's power and lighting load, it may be found possible to connect the entire load on one meter,

**Table II—Typical Small Welder Performance**

| Welder | Open Circuit Voltage | Solid Contact Amp. | Solid Contact Volts | Voltage Drop | P. F. Percentage |
|---|---|---|---|---|---|
| "A" (Arc)..... 60 amp. 220 v. | 235 | 54.8 | 225 | 10 | 24 |
| "B" (Arc)..... No nameplate | 117 | 40 | 109 | 8 | .... |
| "C" (Arc)..... 175 amp. 110 v. | 115 | 57 | 101.2 | 12.8 | 19 |
| "D" (Arc)..... 25 amp. 110 v. | 118 | 63 | 110 | 8 | 25 |
| "E" (Spot)..... 110 v. | 116 | 48 | 106.2 | 10 | 98.8 |
| "F" (Spot)..... 220 v. | 236 | 45.8 | 227 | 9 | 98 |

AN ANCHOR FOR EVERY JOB • • •

Whether it's swampy, rocky, sandy or clay-whether the load is light or heavy - regardless of conditions - there's a Chance anchor that will do the job easily, economically and permanently.



NEVER-CREEP STEEL TWO-WAY

WEJ-LOCK FOUR-WAY

STEEL FOUR-WAY

WEJ-LOCK THREE-WAY

SEMI-STEEL CONE

THIMBLEYE SCREW

SWAMP SCREW

Naturally, you can do a better, quicker, more economical job with the right anchor. To help you in making your anchor selections for each job we have published "Correct Anchoring". Send for copy.

Chance anchors are distributed by leading electrical wholesalers everywhere.

A·B·CHANCE CO.

CENTRALIA, MISSOURI.

but this practice should be discouraged even when possible because it is a potential source of trouble. When such an arrangement is permitted the customer should be informed by letter that the company at its discretion may require the installation of a special transformer and service for the welding load if and when it is found necessary.

## BOOK REVIEWS

### *Electrical Engineers' Handbook*

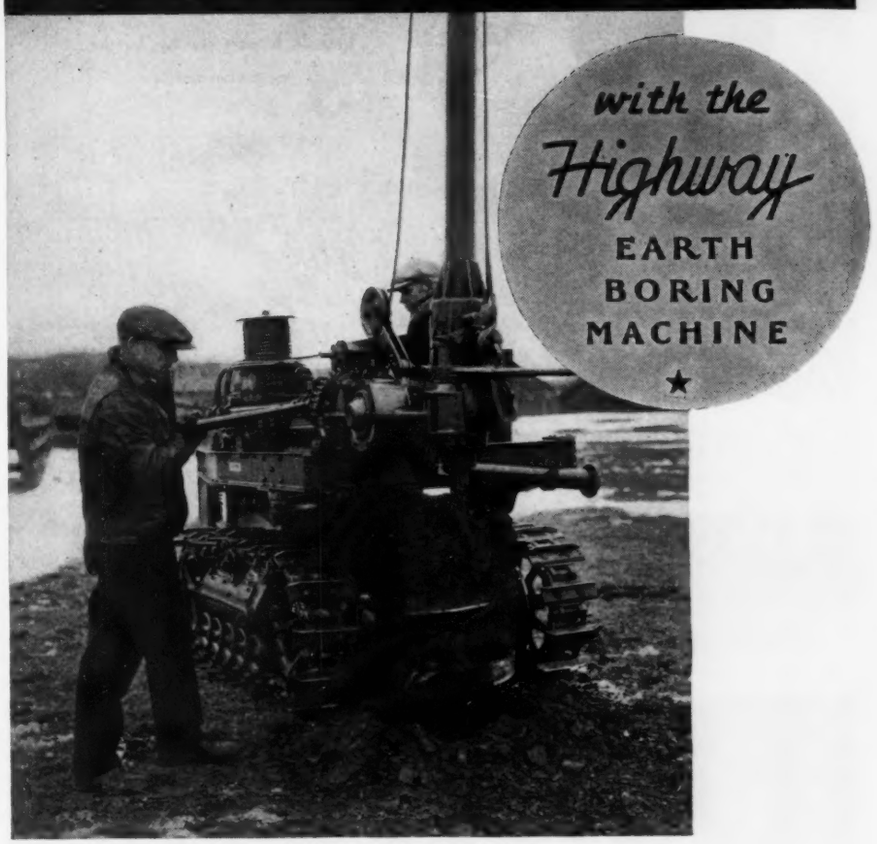
Harold Pender, Ph.D., Sc.D., editor-in-chief; William A. Del Mar, A.C.G.I., and Knox McIlwain, B.S., E.E., associate editors-in-chief. John Wiley & Sons, Inc., New York, 1936. Third revised edition. Electric Power Volume, 1,300 pages, 709 illustrations 5⅝x8⅝, $6; Electric Communication and Electronics Volume. 1,022 pages, 981 illustrations, 5⅝x8⅝, $5.

The third revised edition of Pender's "Electrical Engineers' Handbook" appears in a totally different form than heretofore. Material fundamental to all engineering (*i.e.* mathematics, physics and chemistry) has been removed to a separate volume, Eshbach's "Handbook of Engineering Fundamentals," published in September. This arrangement enables more space to be devoted in the regular handbooks to the various phases of the specialized subjects. Also, the efficiency of "Pender" has been increased by its separation into two volumes, one dealing with electric power and the other with electric communication and electronics. The encyclopedic arrangement used in earlier editions has been abandoned for a more practical sequence of topics. Together these two volumes cover every important topic of electrical engineering.

The Electric Power volume has been consolidated into nineteen sections, each dealing with a general topic. The treatment accorded to each topic has been handled so that each receives attention in accordance with the importance of the subject in relation to other subjects in the field. New topics, such as air-conditioning, electric water-heating and electricity in agriculture, have been included, and topics of newly developed importance, such as automotive electrical engineering and industrial applications of motors have been given correspondingly greater prominence. It will be noted that power transmission and distribution receives a large amount of space, since it was found that this subject is one on which former editions were most frequently consulted.

The Electric Communication and Electronics volume covers the whole field of communication as a unit; it includes telegraphy, telephony, radio broadcasting, point-to-point radio telephony, facsimile transmission and reception, public address systems, sound motion pictures, aviation radio and television. It gives complete information on electronic control systems, for manufacturing processes, theater lighting, welding, blind-landing of airplanes, etc. Materials are arranged in tabular form, with the mechanical and electrical properties listed with each material so that all information about the material is available at a glance. Complete design information is included on all parts of the system: resistors, inductors, capacitors, microphones, loudspeakers, transformers, wave filters, amplifiers, modulators, detectors, os-


DIG THROUGH FROZEN GROUND




BUILD POWER LINES
IN WINTER
AT LOW COST

This dependable tool gives utilities an opportunity to make greater savings than ever before in the cost of setting poles. This is even true in winter time when ground conditions are tough. The Highway reduces the time element in every operation and lightens the amount of manual labor. It adds a higher degree of safety and is of great value in cutting the time for completing new construction programs in any season of the year. With the Highway mounted on truck or tractor you can bore at difficult angles and in hard-to-reach places. There are many types and sizes available. Prepare now for low cost winter line construction with a Highway Earth Boring Machine.

HIGHWAY TRAILER CO.
EDGERTON WISCONSIN

LINCOLN Maximum Demand Meters

When the maintenance factor is considered in the total cost of demand meter installations, then Lincoln Meters are by far the most economical.

Thermo-Responsive Unit

TYPE WD
Watt Demand

*Maintenance costs are low because only one unit moves — and that very slowly*

LINCOLN METER COMPANY
SPRINGFIELD, ILLINOIS

"STILL IN THE LEAD"

P&H PROCESS CEDAR POLES

"P & H"
*Guaranteed Saturation*
SAVES POLE MONEY FOR YOU

Maximum pole life and reduced maintenance costs are assured by a guaranteed saturation of at least thirty-six pounds of preservative per cubic foot to a sapwood depth of one-half inch throughout the groundline area.
Prompt shipment... Western Red or Northern White Cedar poles.

PAGE AND HILL CO.
MINNEAPOLIS • MINNESOTA

cillators, antennas and power supply units, as well as articles on complete transmitters and receivers. The first section of the book contains complete mathematical tables, etc., logarithms, trigonometric, exponential and hyperbolic functions, decibels, etc., and in the section dealing with electron tubes exhaustive tables are given, including the new metal tubes, thyratrons, photo-sensitive, cathode ray and X-ray tubes.

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## *Rich Land, Poor Land*

By Stuart Chase. Published by Whittlesey House, McGraw-Hill Book Company, 330 West 42d Street, New York City. 352 pages, indexed, illustrated. Price, $2.50.

"I have a hat but no rabbit" is Stuart Chase's own admission of the extravagance of his iconoclastic predictions and the diffuse futility of the countering measures. We have wasted our top soil, our timber, our buried resources, our fisheries and our insect-controlling bird life. The future of America is dismal and only A.A.A., R.A., N.R.A., T.V.A., C.C.C. and power dams can help. U. S. A. is prescribed a straitjacket of centralized planning, alleviated a bit by hypodermics of rhetorical fantasy that nearly disarms the conservative but humane skeptic. We need find a new ecology which respects nature and still permits technologic, if not technocratic, progress.

Meanwhile, one finds horrible pictures of devastation, China's wastes transported, which not even a seasoned air traveler could find except in isolated spots. But these hidden catastrophes are ample excuse for British grids and walk-in refrigerators for the backwoods farmer. Meanwhile, our high court only "stands on the bank, admonishing the Colorado River not to violate the Constitution." There are two chapters specifically on the T.V.A. and they outdo the ambitions of its administrators in glamor.

This is enough sampling to show a New Dealer at his best in style and embraciveness. Electrical folks will read this just to get the measure of the foe. Sane people generally will read it to get the measure of a nightmare on an eroded hillside.

•

## *Electricity—for Use or for Profit?*

By Bernhard Ostrolenk. Published by Harper Brothers, 49 East 33d Street, New York City. 211 pages. Price $2.

Essentially this book seems to have been written to advocate the competitive yardstick as a stop-gap between "futile" regulation and future governmental acquisition of utilities. Most startling of the author's proposals is that representatives of some government agency should sit in as members of utility directorates to represent the perplexed stockholders often, in the estimate of the author, at the mercy of avaricious management.

Throughout, there is hardly a good word for the utility industry or its social contributions. In lauding the present Administration's program, the professor is frequently guilty of such inaccuracies as "utilities usually do not report earnings on their capital equal to the 7 per cent allowed them *by their contract* with public service commissions" and "the Tennessee Electric Power Company suddenly prospered" (as a result of T.V.A. invasion). For *those* who like warmed-up victuals from the Federal Trade and other ice boxes there have already been several better-framed books on correctives for utility errors of commission and omission.

## Recent Rate Changes

WASHINGTON STATE DEPARTMENT of Public Works has set December 17 for the hearing in Seattle of a complaint against the Puget Sound Power & Light Company's practice of allowing a special discount on rates to Seattle business establishments and apartment house operators. These discounts, also allowed by City Light, are effected by permitting owners of buildings to pool their power requirements for more than one building, in order to get a volume rate, according to information brought out at a City Council investigation last year. Municipal Lighting Superintendent J. D. Ross, declared he was compelled to follow the practice of the power company, in order to meet its competition, and that he would discontinue the special discounts if the power company were required to abandon them.

ARKANSAS STATE UTILITIES COMMISSION has postponed until December 15 resumption of a hearing on the complaint of western Arkansas coal mine operators against the Southwestern Gas & Electric Company involving electric rates for mine operators and general consumers in that section. Hearings have been held at intervals during the past several months and additional time was requested by the utility company to assemble exhibits. Oral arguments will be heard at December 15 session.

NEW BEDFORD GAS & EDISON LIGHT COMPANY has filed a schedule providing for rate reductions saving 42,000 of its customers $192,000 a year. The new rate eliminates a $9 minimum charge per year, as no bill will be rendered in any month when no meter registration takes place. The rate is: First 10 kw.-hr., 60 cents; next 50, 5 cents per kilowatt-hour; next 60 and above, 2½ cents each. The schedule was set to go into effect December 1.

WISCONSIN POWER & LIGHT COMPANY has reduced its electric rates $8,000 a year to 40 large combined lighting and power customers throughout its territory under authorization of the state Public Service Commission. Chiefly large mercantile establishments will benefit from the reduction in such cities as Sheboygan, Fond du Lac, Beloit, Janesville and Baraboo.

CUMBERLAND PUBLIC SERVICE COMPANY'S patrons in Tompkinsville claimed the signatures of a majority of electrical users in Monroe County, Kentucky, to a petition to be submitted to the state Public Service Commission, asking that the company be required to lower rates and improve its service. The patrons also are asking that if their request is not met, the city of Tompkinsville be allowed to obtain cheaper current through facilities of the Rural Electrification Administration. The plan here is for erection of lines connecting at Fountain Run and other points in western Monroe County. Arrangements to serve other towns in the Kentucky-Tennessee border territory are being made. The matter of a franchise is in dispute here. The company claims it owns the franchise for Tompkinsville, a twenty-year term with nine years left before expiration.

TONAWANDA POWER COMPANY has filed a revision of rates effective December 1 in the town of Grand Island, Erie County, with the Public Service Commission. The character of service is changed to take care of the change from 25 to 60 cycles which was made in that town last summer. A new commercial rate is introduced which is of the same type as that in the rest of the territory and eliminates the counted socket rate for commercial users. It eliminates de-


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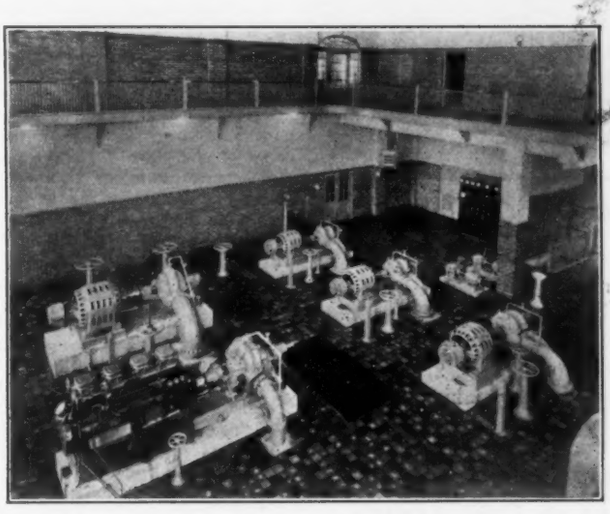

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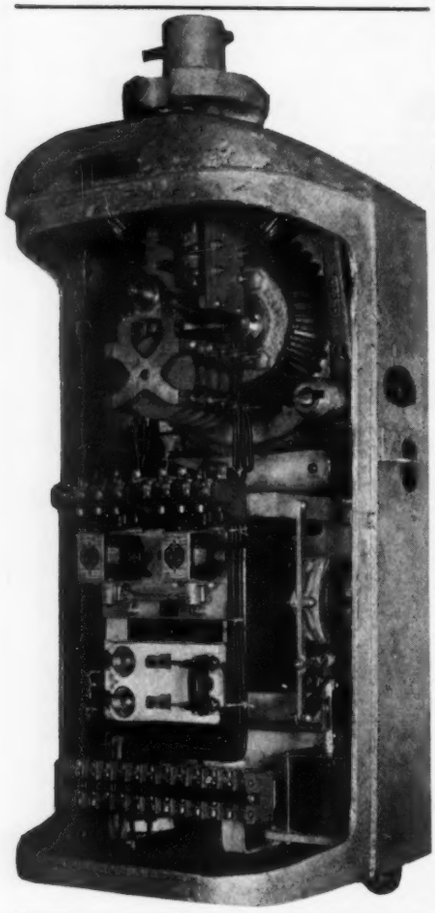

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mand for users with less than 5 kw. demand by basing the demand on energy consumption. The smaller customers are transferred to the new rate and will save about $150 a year, which is 8 per cent of total revenues.

ROCKLAND LIGHT & POWER COMPANY has filed revision of rates for commercial service with the New York Public Service Commission which is estimated to save commercial customers of the company about $24,400 annually. The revisions apply to commercial service only under three rates; one is available in the eastern division of the company's territory, another in the cities of the western division and the other outside of cities in the western division.

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## Municipal Plants

SANDPOINT, IDAHO—Suit has been filed in the north Idaho district court by the Mountain States Power Company against the city asking for a preliminary injunction restraining the city from issuing any of the $300,000 bond issue authorized at an April, 1936, election for the construction of a municipal power project. The complaint of the Mountain States Power Company, which serves the Sandpoint region, alleges that the city of Sandpoint abandoned its project and allowed its water rights on Priest River to lapse by not complying with the requirements of its permit. It points out that the city has acquired no water rights to the waters of Priest Lake because the 1927 Idaho Legislature authorized the Governor to appropriate in trust for the people of the state all of the unappropriated waters of the lake and that such appropriation was made. The complaint further alleges that the sale of a portion of the bonds, in the sum of $50,000 would be wasteful and extravagant and of no benefit to the taxpayers.

AUGUSTA, GA.—The proposed municipal hydro-electric project, involving approximately $1,000,000, was voided recently in Atlanta, when the Supreme Court of Georgia held that the contract between the city, P.W.A., the Georgia Power Company and the August Canal Commission was illegal because it created a debt against the municipality that could not be paid out of revenues for the current year. This was held to be in violation of the state Constitution. Special acts of the state Legislature were necessary to permit plans for the project to go forward, but the injunction proceedings brought by James L. Cartledge, formerly Richmond County legislator, stopped all progress. The injunction was denied in the Richmond Superior Court, but this action was reversed by the Supreme Court, which declared the restraining order should have been granted. P.W.A. made a conditional grant of $193,000 and the power company contracted to purchase $700,000 worth of bonds to finance the hydro-electric project, the city agreeing to divide the electric business with the company on a non-competitive basis.

BOONVILLE, IND.—Suit to condemn the local electric light plant of the Southern Indiana Gas & Electric Company and purchase the property for a municipal plant has been filed by the city in the Warrick Circuit Court. At the special election held on December 17, 1935, the city voted 975 to 728 to purchase the property. Following the election, the petition states, overtures were made to the company to purchase the property without result. A condemnation suit then was decided upon. The City Council had engineers inventory the property. The engineers estimated the value at $205,000 and this price was offered the company. There is a bonded mortgage of $5,500,000 on


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the property held by the Bankers Trust Company of New York. The property was purchased by the Southern Indiana Gas & Electric Company from Boonville owners for $1,000,000 in 1928.

WALKON, IOWA—Through a favorable vote obtained at the recent election the city has granted to the Interstate Power Company a fifteen-year franchise to furnish electricity to the city.

LOUISA, KY.—Southern Public Service Company has offered the city electrical rate reductions totaling $1,000 a year, or free street lights for one year, in return for a new five-year renewable franchise. Voters defeated a bond issue for erecting a municipal plant.

HAMBURG, MINN.—Village Council has unanimously granted a new twenty-year franchise to the Northern States Power Company.

GREEN ISLE, MINN.—Northern States Power Company, which has served the town for the last quarter century, has been granted a new twenty-vear franchise by the village Council.

WALNUT GROVE, MINN.—City Council has granted a ten-year franchise to the Interstate Power Company for furnishing electric energy to the city. A new schedule of lower rates will become effective at once.

BRIDGEPORT, OHIO—A city move for a referendum on a municipal power plant was defeated by voters at the recent election. Wheeling Electric Company serves the city.

FAYETTEVILLE, TENN.—City plans to seek modification of an injunction restraining it from issuing $150,000 of bonds for construction of a municipal power system. Tennessee Electric Power Company obtained the injunction in Chancery Court on a claim that it enjoyed an exclusive power franchise in the city. In a general answer to the claim, the city cited a municipal ordinance which it contended does not give the company an exclusive franchise. H. T. Holman, member of counsel representing the city, stated he would seek modification of the injunction so that the city may issue bonds for $150,000 for construction of the municipal power system.

PLAINVIEW, TEX.—Litigation between the Texas Utilities Company and the city involving the application of the city for a P.W.A. loan and grant of $423,000 for construction of a municipal electric light and power plant has been settled out of court. Under the terms of agreement between the two parties the city withdraws its application for the loan and grant and dismisses the penalty suit now on appeal against the Texas Utilities Company for alleged failure to file financial reports as required by Texas law. The Utilities company agrees to cease opposition to an application for a $100,000 P.W.A. loan and grant with which the city would construct a water plant and to pay fees to engineers and attorneys for which the city may be liable. Schedules of reduced rates for light and power by the Texas Utilities Company were included in the agreement.

BRENHAM, TEX.—City Council has been officially notified that the P.W.A. has made a grant of $140,000 for the construction of a municipal electric light and power plant here and that the allotment has been approved by President Roosevelt. The total cost of the plant will be approximately $310,000, of which sum $170,000 will be provided by a bond issue. The Texas Power & Light Company is now serving the city.

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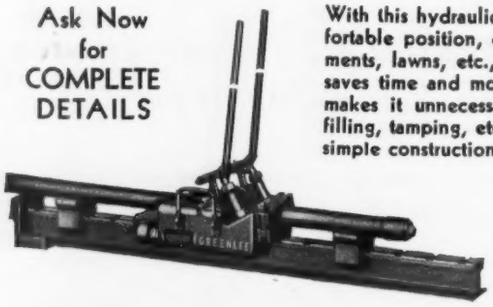

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## SALES OPPORTUNITIES

LLANO, TEX.—Board of Directors, Lower Colorado River Authority, Littlefield Building, Austin, Tex., receives bids until December 15 for equipment for hydro-electric power plant at Dam No. 1, Colorado River, Llano County, including two 12,500-kva. generator units with complete accessories, two 17,300-hp., hydraulic turbines, with governors, pumping machinery and auxiliary operating equipment.

YOUNGSTOWN, OHIO — Youngstown Sheet & Tube Company plans installation of heavy-duty motors and controls, transformers and accessories, switchgear, conveyors, electric hoists, electric cranes and other equipment at Campbell and Brier Hill mills in Youngstown area where extensions and improvements will be carried out, including erection of new main unit, 120 x 900 ft. for cold rolled steel mill. Project is scheduled for completion in 1937. Cost over $5,000,000.

PAGE, N. D.—Otter Tail Power Company, Fergus Falls, Minn., plans extension in transmission lines from Page to Bedford, N. D. Application has been made for permission.

OWOSSO, MICH.—City Commission is considering a petition for proposed municipal electric power plant and electrical distributing system. Estimates of cost will be made soon.

ANAMOSA, IOWA—Jones County Rural Electrification Co-Operative, Inc., Anamosa, recently organized, plans primary and distributing lines in parts of Jones and Jackson Counties, totaling about 200 miles, for rural electrification, including power substation and service facilities. Bids will be asked soon. Fund of $210,000 has been secured through federal aid.

EL CENTRO, CALIF.—The Imperial Irrigation District, El Centro, has plans under way for hydro-electric generating plant on All-American Canal, now being constructed by Government, forming first unit of series of four such stations at points known as Drops Nos. 2, 3, 4 and 5, where substructures for proposed developments are being built by Bureau of Reclamation. Initial plant will be equipped for rated capacity of 12,000 kva., and fund of $2,760,000 has been secured through P.W.A. for construction, including transmission lines to points in Imperial Valley area and power substation facilities. Bids for equipment are scheduled to be asked soon. Generating stations to be built later at other locations noted will have a gross capacity of 42,200 kva., making total rating of 54,200 kva. for entire project.

MANASSAS, VA.——Bull Run Power Company plans extensions and improvements in electric generating plant, including installation of additional equipment. Company will also make extensions in transmission and distributing lines for rural electrification in this area. Fund of $86,000 has been secured through federal aid. Proposed to begin work soon.

LORAIN, OHIO—Steel Stamping Company, Lorain, plans installation of motors and controls, conveyors, electric hoists and other equipment in group of four new additions to steel products plant. Improvements will be made in steam power house at works, with installation of additional equipment. Entire project will cost about $125,000. F. J. McFadden, West Erie Avenue, Lorain, is architect.

OHIO CITY, OHIO—Has plans maturing

for municipal electric power plant, for which bids will be asked soon. Fund of $40,000 has been secured through federal aid. Carl J. Simon, Van Wert, Ohio, is consulting engineer.

JACKSONVILLE, FLA.—Will have plans completed soon for extensions and improvements in city-owned steam-operated electric generating station, including installation of new steam-electric turbo-generator unit and auxiliary equipment for large increased capacity. Additions will be made in power substation and distribution lines. Fund of $2,377,000 is being arranged, of which $1,127,000 is represented by a federal grant. Department of Public Utilities, Ernest E. Anders, commissioner, is in charge.

COLLIERS, W. VA.——Guarantee Specialty Manufacturing Company East Ninety-sixth Street, Cleveland, Ohio, plans installation of motors and controls, conveyors, transformers and accessories, and other equipment in proposed new metal products manufacturing plant at Colliers, where site has been acquired. Cost about $150,000.

BROOKLYN, N. Y.—Williamsburgh Power Plant Corporation, 385 Flatbush Avenue, will begin work soon on extensions and improvements in steam-electric generating plant, used for power supply for Brooklyn-Manhattan Transit System, including installation of two new 25,000-hp. turbo-generator units and accessories, two high-pressure boilers, pumping machinery and auxiliary equipment; additional power substation facilities will be provided, with transformers, switchgear, etc. Project will be carried out under direction of Stone & Webster Engineering Corporation, Boston and New York, which recently secured contract for design and construction. Cost estimated at $4,300,000.

BAY CITY, TEX.—Has called special election to approve bonds for $225,000 for proposed municipal power plant and acquisition of local electrical distributing system of Central Power & Light Company, in which extensions and improvements will be made, as recently referred to in these columns. Garrett Engineering Company, 308 Hughes Street, Houston, Tex., is consulting engineer, in charge.

ASHLAND, WIS.—Lake Superior District Power Company, Ashland, plans extensions and improvements in local generating station, including installation of additional equipment for increased capacity. Cost about $875,000. Permission has been secured. Work scheduled to begin soon.

SEWARD, ALASKA—Has rejected single bid recently received for municipal hydro-electric generating plant on Lost Lake, about 11 miles from town limits, and will ask new bids about March 1937, including two 375-kva. hydraulic turbine generator units with accessories, power substation, transmission line to municipality and electrical distributing system. Fund of $140,000 is available through federal aid. Hubbell & Waller Engineering Corporation, Alaska Building, Seattle, Wash., is consulting engineer, in charge.

PONCA CITY, OKLA.—Has plans maturing for extensions and improvements in city-owned electric generating plant, to including installation of new 2,250-hp. diesel engine-generator unit and complete accessories, switchboard and switchboard galley equipment, metalclad switchgear and miscellaneous equipment. Bond issue for $175,000 is being arranged. Bids scheduled to be asked soon. Burns & McDonnell Engineering Company, 107 West Linwood Boulevard, Kansas City, Mo., is consulting engineer.


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